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PRACTICAL SEAMANSHIP

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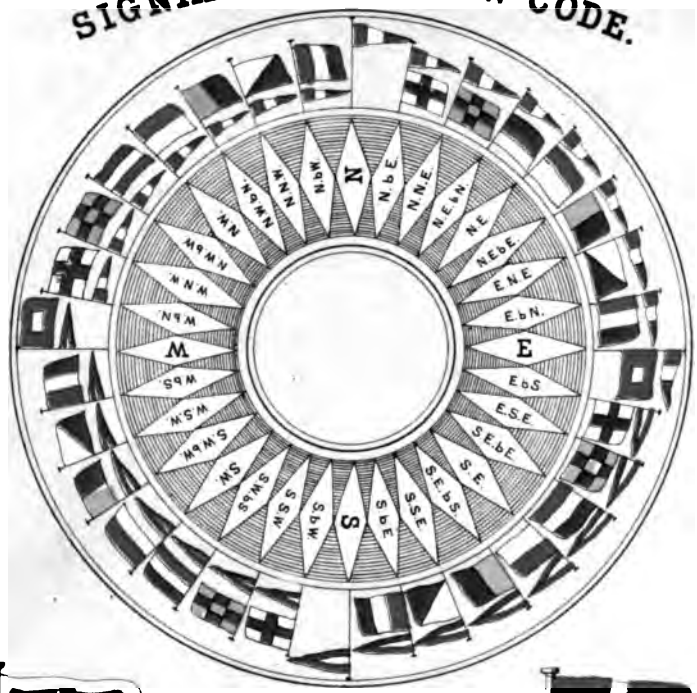
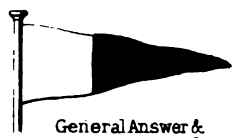


For Calling Officers.
At the Fore, for a Pilot.

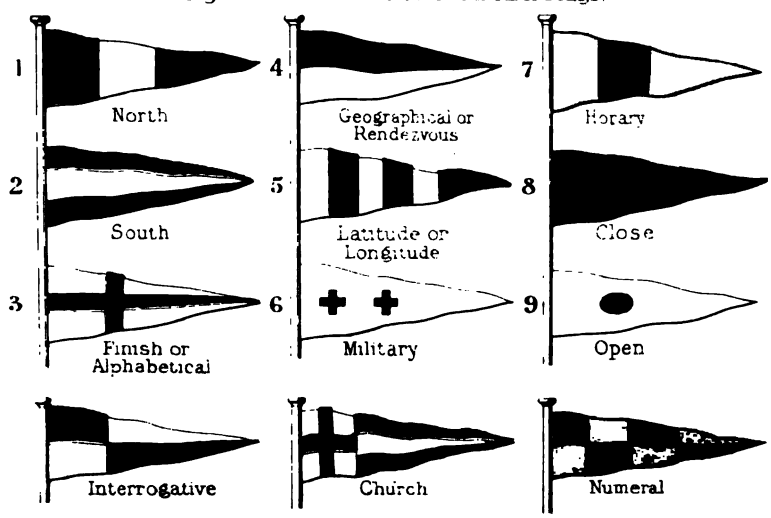


General Answer &
Substitute for upper flag

Admiral's Affirmative,
& duplicate of Numeral above it

PENDANTS, &c

Signification when hoisted with other Flags.



SEAMANSHIP:

INCLUDING

NAMES OF PRINCIPAL PARTS OF A SHIP;
MASTS, SAILS, YARDS, &c.; KNOTS AND SPLICES;
FITTINGS OF STANDING RIGGING; RIGGING OF MASTS;
YARDS AND BOWSPRIT; FITTINGS OF TACKLES;
SETTING UP RIGGING; TANKS, BALLAST, AND PROVISIONS;
RULE OF ROAD & VESSEL'S LIGHTS; SEA TERMS; MANAGING SAILS;
BOAT SAILING; STOWAGE OF ANCHORS AND CABLES;
TO UNMOOR AND PROCEED TO SEA; MECHANICAL POWERS;
MANŒUVRING; TO TACK SHIP; TRIMMING SAILS;
MAKING AND SHORTENING SAIL;
ROPES AND SPARS CARRIED AWAY;
INSTRUCTIONS ON THE MANAGEMENT OF BOATS IN A SURF,
&c. &c.

BY

COMMANDER G. S. NARES, R.N.

FOURTH EDITION, REVISED AND CORRECTED,

With Three Hundred and Fifty Illustrations, and Coloured Sheets of

SIGNAL FLAGS—NEW CODE, PENDANTS, NUMERAL FLAGS, ALPHABETICAL FLAGS, SAIL SIGNALS, BEACON SIGNALS, SIGNAL FLAGS USED BY BRITISH MEN-OF-WAR FOR COMMUNICATING BY THE COMMERCIAL CODE, SIGNAL FLAGS FOR BRITISH MERCHANT VESSELS, &c.

USED ON BOARD H.M. TRAINING SHIP "BRITANNIA,"
BY SANCTION OF THE LORDS COMMISSIONERS OF THE ADMIRALTY.

JAMES GRIFFIN AND CO.
2, THE HARD, PORTSMOUTH:
LONGMANS, GREEN, READER AND DYER, LONDON.
1868.

231. e. 19.

PREFACE.

WHILE the value of seamanship is in no degree lessened by the employment of steam as a motive power for H.M. Ships of War, the opportunities afforded to young officers of acquiring professional knowledge by practical experience are greatly reduced, it is on this account therefore more than ever essential that they should study the art of seamanship theoretically.

Limited stowage for coal renders it necessary to reserve steam for occasions of actual conflict, and gives no option as to the use of sails when a fleet is cruising in time of war.

Engines and machinery, liable to many accidents, may fail at any moment, and there is no greater fallacy than to suppose that ships can be navigated on long voyages without masts and sails, or safely commanded by officers who have not a sound knowledge of seamanship.

H.M.S. BRITANNIA,
March, 1862.

IN issuing the 4th Edition of this work, after careful revisal and correction, the publishers express the hope that it may be found more valuable than ever to the officers of the Royal Navy and Mercantile Marine. They beg to acknowledge, with grateful thanks, the services rendered to them by Lieut. Frederick Walter, R.N., of H.M. Training Ship, "Britannia," who, in the absence of Captain Nares, on Foreign Service, has seen his notes and corrections carefully carried out, and brought a large amount of practical experience to bear on the subject.

THE HARD, PORTSMOUTH,
January, 1868.

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SEAMEN'S PROVERBS.

"A red sky in the morning,
Sailors take warning;
A red sky at night
Is a sailor's delight."

"The evening red and morning grey
Are sure signs of a fine day;
But, the evening grey and morning red
Make the sailor shake his head."

"With the rain before the wind,
Your topsail halyards you must mind;
But, when the wind's before the rain,
You may hoist your topsails up again."

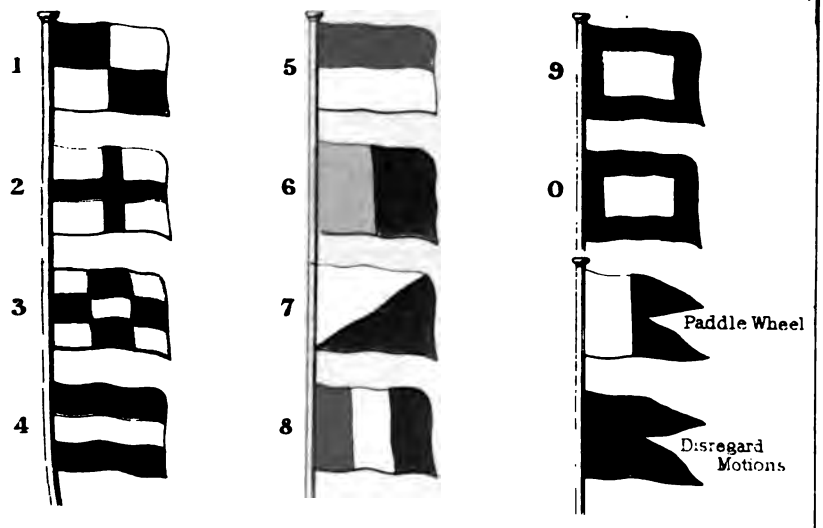
"If clouds are gathering thick and fast,
Look out sharp for sail and mast;
But, if they lag upon their road,
Keep your flying kites abroad."

"He who strives the tempest to disarm,
Must never first embrail the lee yard arm."

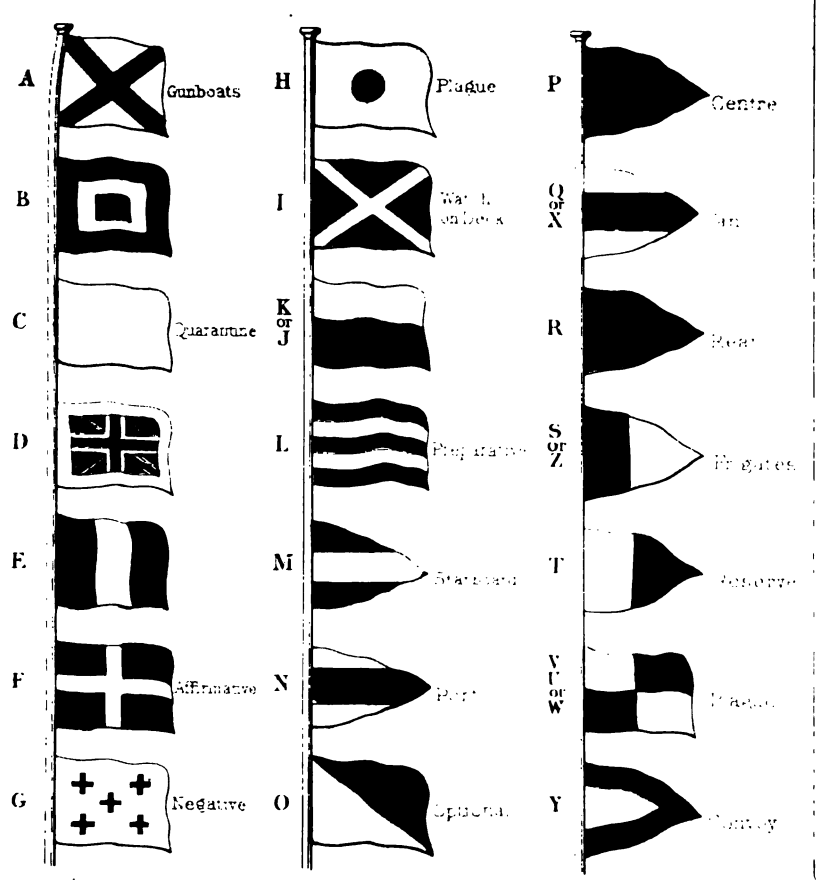
Relating to the Hurricane Months in the West Indies.

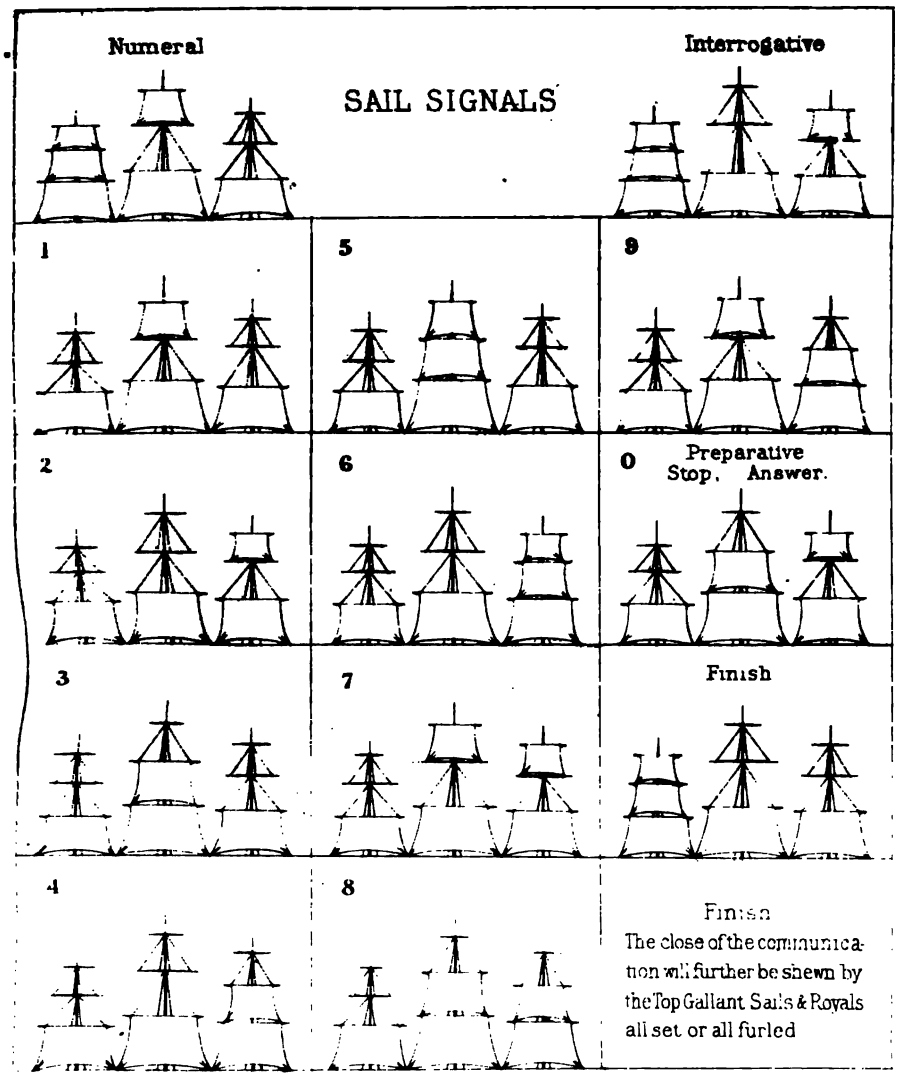
"June, too soon;
July, stand by;
August, look out you must;
September, remember;
October, all over."

NUMERAL FLAGS.



ALPHABETICAL FLAGS





BEACON SIGNALS.

Ships may pass to the Northward of this Beacon.

Ships may pass to the Southward of this Beacon.

Ships may pass to the Eastward of this Beacon.

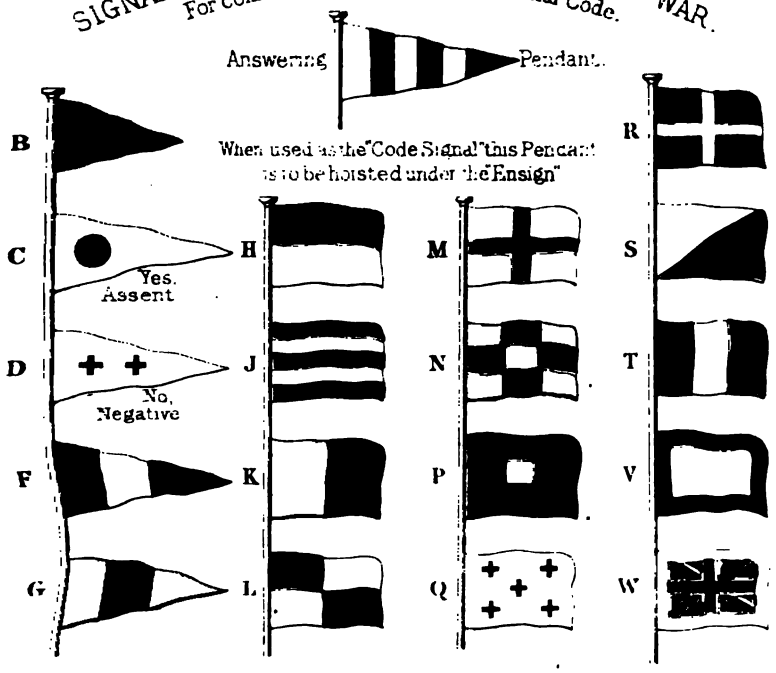
Ships may pass to the Westward of this Beacon.

On Rock or Shoal, Ships may pass on either side.

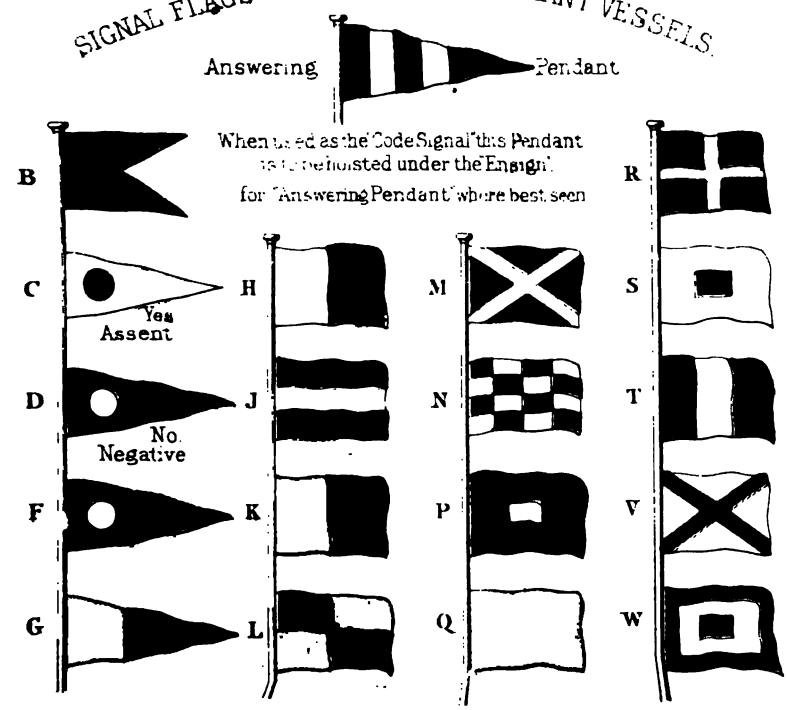
GRIFFIN & Co PORTSEA

SIGNAL FLAGS USED BY BRITISH MEN OF WAR.

For communicating by the Commercial Code.



SIGNAL FLAGS FOR BRITISH MERCHANT VESSELS.



SEAMANSHIP.

NAMES OF THE PRINCIPAL PARTS OF A SHIP.

A SHIP is divided lengthways, into the *Fore*, *Midship*, and *After* parts.

The *bow*, is the front or foremost end of the ship.

The *midship*, is the middle part of the length.

The *stern*, is the aftermost end of the ship.

The *starboard* side, is the right-hand side looking towards the bow.

The *port* side, is the left-hand side, looking towards the bow.

Keel.—Is the principal piece of metal or timber at the lowest part of the ship, running fore and aft; it is the foundation from which all the other parts rise to form the ends and sides of the ship.

Stem.—Rises from the forepart of the keel to form the bow.

Stern post.—Rises from the after part of the keel to form the stern (Fig. 1).

Body post.—Rises from the keel before the stern post. The space between it and the stern post is called the screw-aperture (Fig. 1).

Ribs.—A figurative expression for the framework which, resting on the keel, forms the sides of a ship.

Keelson.—An internal keel, lying fore and aft above the main keel and lower pieces of the ribs confining the floors in their places.

Knight heads.—Are two strong uprights, one on each side of the upper part of the stem, to strengthen the bow and support the bowsprit.

False keel.—An additional keel below the main keel. By offering greater resistance, it prevents the ship being driven

so much sideways through the water away from the wind. It also protects the main keel, should the ship take the ground.

Gripe.—A projection forward at the lowest part of the stem; by exposing a larger surface it prevents the foremost part of the ship, when sailing with the wind on one side, from being driven *sideways* away from the wind, and therefore effects the turning power of the ship.

Garboard strakes.—The lowest planking outside, nearest to the keel, running fore and aft.

Bends.—Are the thickest outside planking, extending from a little below the water-line up to the lower deck ports.

Counter.—The afterpart of the bends, the round of the stern.

Run.—The narrowing of the afterpart of the body of the ship below the water.

Limbers.—Gutters formed on each side of the keelson to allow the water to pass to the pump-well.

Limber boards.—Form a covering over the limbers.

Pump-well.—An inclosure round the mainmast and pumps.

Beams.—Horizontal timbers lying across the ship, to support the decks and connect the two sides.

Shelf piece.—Extends all round the ship inside for the beams to rest upon.

Waterway.—Thick planking extending all round the inside of the ship immediately above the beams.

Partners.—Frames of timber fitted into the decks to strengthen them, immediately round the masts, capstans, bitts, &c.

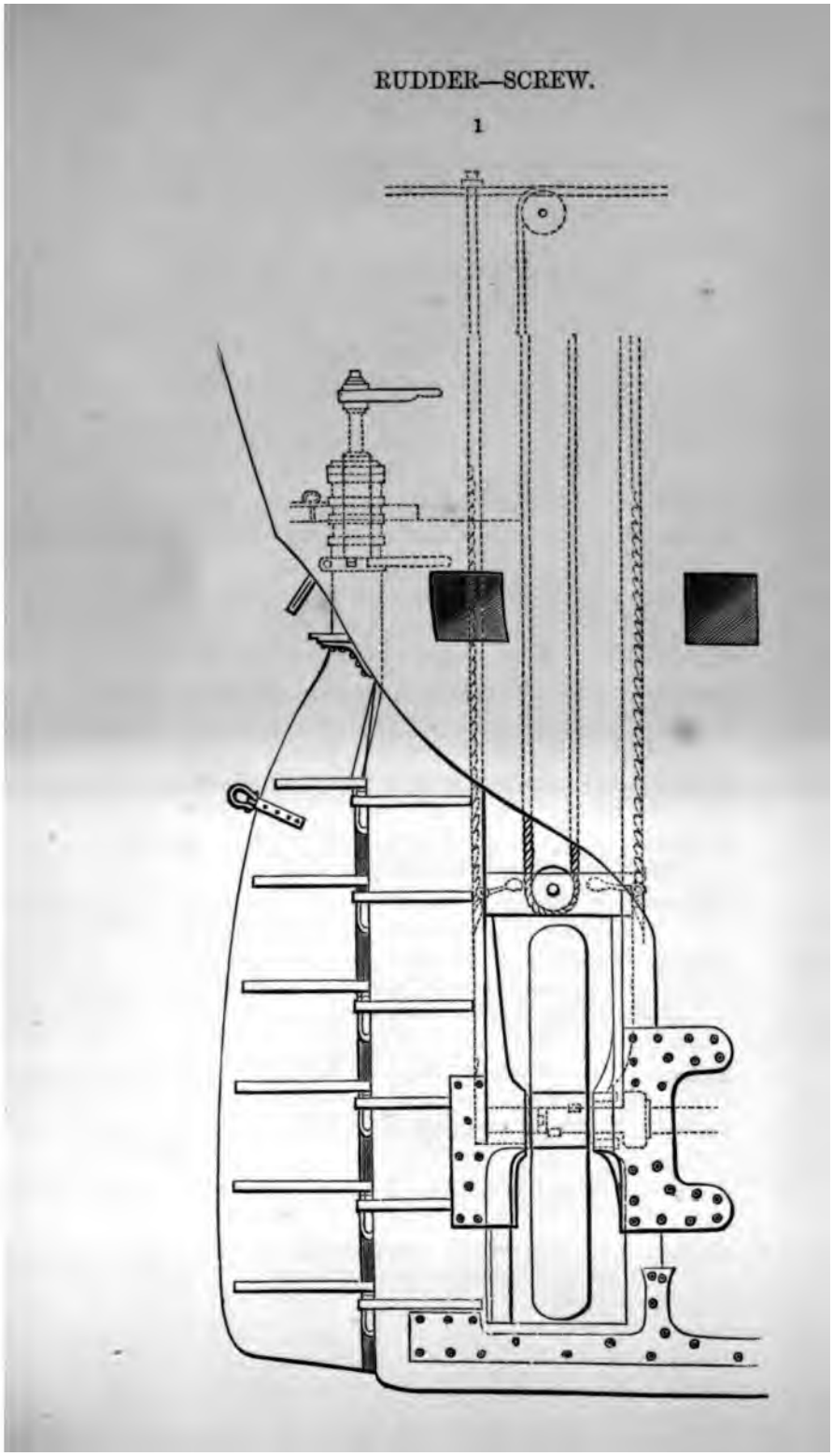
Carlings.—Short pieces of timber, running fore and aft, connecting one beam to another, to distribute the strain of the masts, capstan, and bitts, among the several beams so connected.

Knees.—Pieces of iron uniting the beams to the shelf piece and the ship's side.

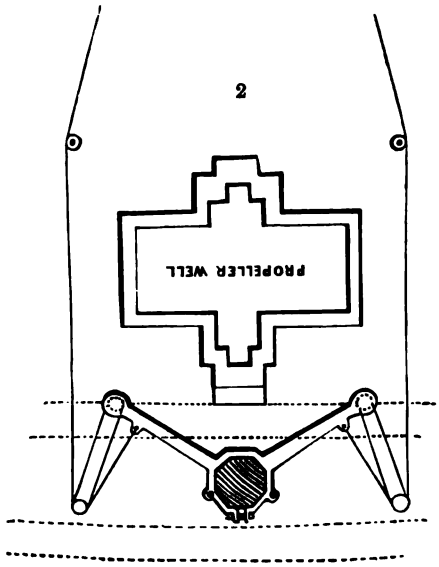
Stanchions.—Pillars of metal or wood supporting a beam amidships.

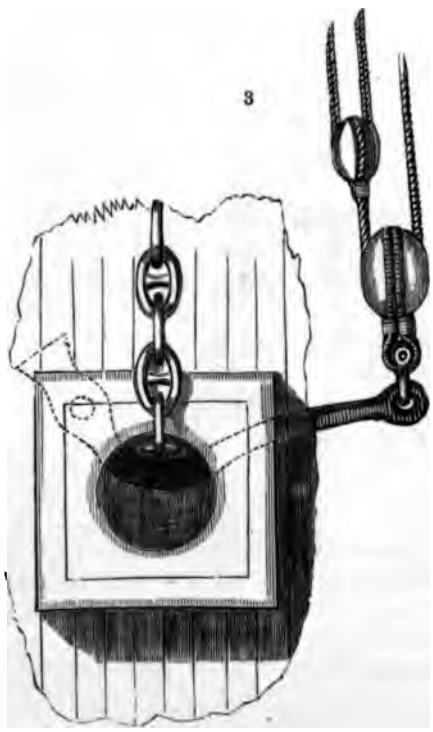
Treenails.—Wooden bolts used in fastening the planks to the timbers and beams.

Caulking.—Driving oakum between the planks, it is then *payed* (filled in) with pitch or marine glue.



STEERING YOKE—COMPRESSOR.





The rudder.—Hangs upon the stern post by pintles and braces, for steering or directing the course of the ship (Fig. 1).

Tiller.—A piece of timber or metal fitted fore and aft into the head of the rudder, by which to turn it in steering.

Yoke.—A cross-piece of timber or metal fitted on the rudder head when a tiller cannot be used (Fig. 2).

Wheel.—A wheel, to the axle of which the tiller or wheel ropes are connected, by which to move the rudder.

Helm.—The rudder, tiller, and wheel, or all the steering arrangements of a ship.

FITTINGS.

Hatchway.—An opening in the deck, forming a passage from one deck to another, and into the holds (Fig. 293).

Coamings.—A raised boundary to the hatchways, to keep water from going down, &c. (Fig. 293).

Gratings.—An open covering for the hatchways.

Scuttles.—Round holes in the ship's side for ventilation.

Scuppers.—Holes cut through the ship's side for letting any water run overboard off the decks.

Hawse Holes.—In the bows of the ship, for the cables to pass through (Fig. 293).

Hawse Plugs.—Plugs made to fit the hawse holes, to prevent any water coming inboard.

Bucklers.—Shutters fitted to confine the hawse plugs in the hawse holes, and keep them from being washed inboard.

Manger.—Part of the deck partitioned off forward, to prevent any water that may enter through the hawse holes from running aft over the deck (Fig. 293).

Chain-pipes.—For leading the cable through, as it passes up from one deck to another, from the chain-lockers (Fig. 275).

Ridings bitts.—Timber heads fixed amidships, in the forepart of the deck, to which, with the assistance of deck-stoppers and the compressor, the cable is secured (Fig. 293).

Compressor.—A large movable iron lever, fixed at the bottom of each chain-pipe; with the help of a tackle the chain is controlled or stopped as it runs out, by being nipped

between the compressor and the lower part of the chain-pipe (Fig. 3).

Capstan.—A solid barrel of wood, turning round horizontally on a centre spindle: it is used, with the assistance of capstan bars, for weighing the anchor, lifting heavy weights, &c. (Fig. 4).

Bitts round each lower mast,
Fife rails, on the ship's side, abreast each mast,
Belaying pins (Fig. 5),
Cleats (Fig. 6),
Cavil or Kevel.—A large cleat,
} For belaying ropes.

Bollard heads.—Timber heads left in the ship's side, clear of the planking, to which the anchor stoppers, hawsers, &c., are secured (Fig. 6 *b*).

Cat-head.—A piece of timber projecting from each bow of the ship to support a bower anchor (Fig. 271).

Fish davit.—A movable piece of timber for raising the fluke of an anchor and placing it on the bill board (Figs. 283, 288).

Bill board.—A ledge on the ship's side to support the fluke of the bower anchor (Fig. 295).

Bumpkin.—A boom fixed to each bow for hauling the foretack down to (Fig. 205).

Channels.—Platforms projecting outwards from the ship's side, to give a greater spread to the lower rigging (Figs. 7, 8).

Dead eyes.—Used in securing the lanyards of the shrouds (Figs. 121, 122, 123).

Chain plates.—Iron plates for securing the lower dead eyes to the ship's side (Fig. 7).

Goose neck.—An iron outrigger to support a boom (Fig. 9).

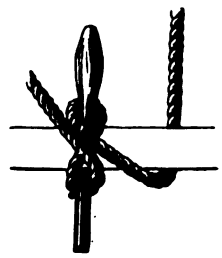
Spider.—An iron outrigger to keep a block clear of the ship's side (Fig. 10).

Davits.—Wooden outriggers projecting from the ship's side to hoist the boats up to.

SECURING A ROPE.

4

5



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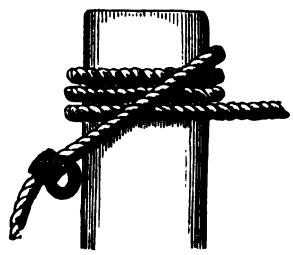
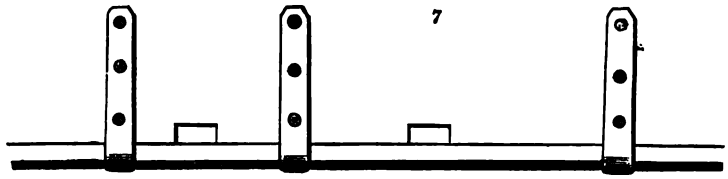


CHANNELS—CHAIN PLATE—GOOSENECK.

7



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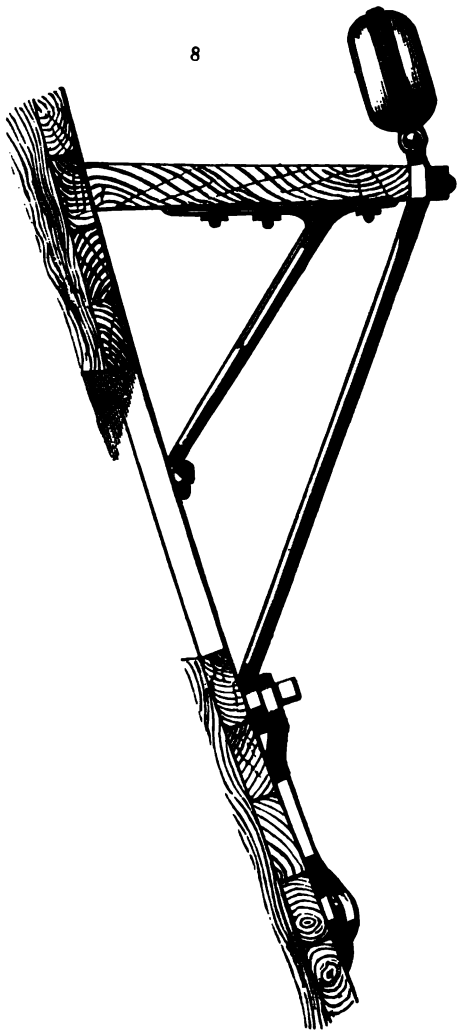


9

NAMES OF MASTS, YARDS, AND SAILS.

When a ship is propelled through the water by means of *sails.*

Masts, (Figs. 120, 121) a *bowsprit,* (Figs. 154, 245) and *booms.*—Are placed to spread the sails upon.

In a vessel with three masts they are named the *fore,* the *main,* and the *mizen* masts.

The mainmast (Fig. 245).—Is the middle and largest mast of the three.

The foremast (Fig. 245).—Is the furthest forward, and is the next in size to the mainmast.

The mizenmast.—Is the aftermost and smallest mast of the three.

Each mast, taken as a whole, is composed of four pieces, one above the other, each of which has its distinguishing name.

The lower masts (Figs. 120, 121).—Are the lowest pieces of each mast, or those attached to the ship; they rest or step on the keelson at the bottom of the ship.

In a screw steamer the screw shaft prevents any mast abaft the engines being stepped on the keelson. It is then stepped on the lower deck, which is well supported with extra stanchions.

The topmasts (Figs. 120, 121).—Are the next pieces above the lower masts, and are supported by the lower trestle-trees.

The top-gallant masts (Figs. 120, 121).—Are the next pieces above the topmasts, and are supported by the topmast trestletrees.

The royal masts (Figs. 120, 121).—Are the upper pieces, and are a continuation upwards of the top-gallant masts.

Thus there are three principal masts, each of which is composed of four masts.

To distinguish any particular mast, one of the principal names, *fore, main,* or *mizen,* is prefixed to its other name; thus, the masts connected with the *foremast* are, the *fore-topmast, fore-top-gallant mast,* and *fore-royal mast.*

Trysail masts.—Are small masts placed immediately abaft the lower masts; to which they are connected.

The bowsprit (Fig. 154).—Projects out from the bows.

The jib-boom (Fig. 154).—Is outside of, and supported by the bowsprit, by means of the heel and crupper chains.

The flying jib-boom (Fig. 154).—Is outside of, and is secured to the jib-boom, the heel steps against the bowsprit cap.

The sails are spread upon *yards*, one of which is crossed upon each mast; or upon half yards, called *gaffs*, on the after side of a mast; or upon stays or *booms*.

The masts, yards, gaffs, stays, and booms, are named the same as the sails which they spread; thus, the main-sail is set upon the *main-mast*, and is spread by the *main-yard*. The main royal upon the *main royal mast* and *yard*. The spanker, upon the *spanker gaff* and *spanker boom*. The main trysail, upon the *main trysail mast* and *gaff*. The fore-topmast studding-sail, upon the *fore-topmast studding-sail yard*, and *fore-topmast studding-sail boom*.

The *jib* is set upon the *jib-boom* and a stay leading from the fore topmast head to the *jib-boom* end, which is called the *jib-stay*.

The *flying jib* is set upon the *flying jib-boom*, and a stay leading from the fore top-gallant mast head to the *flying jib-boom* end, which is called the *flying jib-stay*.

A staysail.—Is a three-cornered sail set upon a stay, and is named after it; thus, the *fore-topmast staysail* is set upon the fore-topmast stay.

A trysail.—Is set upon a gaff and trysail mast abaft each lower mast, but it has no boom.

The spanker.—Is set upon a gaff, the mizen trysail mast, and boom, abaft the mizen mast (Figs. 246, 247).

A fore-and-aft sail.—Is any sail not set upon a yard; that is, one set upon either a stay or gaff—such as the *jibs*, *staysails*, *trysails*, and the *spanker*.

Studding-sails (Fig. 260), are sails set outside the square sails on each side of the ship, and are spread at the top upon yards, and at the bottom by booms; they are set upon each side of the foresail, fore-topsail, fore-top-gallant sail, main-topsail, and main-top-gallant sail. They are named by their respective masts; as the *main-topmast studding-sail*, *fore-top-gallant studding-sail*, &c.

There are no studding-sails on the mizenmast, or on either side of the main-sail.

The lower yard on the mizenmast has no sail set below it, and is named the *cross-jack* yard.

To give more support to the jib and flying jib-booms, *gaffs* are placed on the bowsprit to spread the rigging out in each direction and give it a larger angle.

A dolphin striker.—Is thus used in connexion with the martingale (Fig. 154).

Spritsail gaffs.—In connexion with the jib guys (Fig. 154).

This name is derived from a sail which, in former times, was set on a yard below the bowsprit.

PARTS OF A MAST, BOWSPRIT, AND YARD.

Step.—The timber on which the heel or bottom of a mast or bowsprit rests.

Housing.—From the heel of the mast to the upper deck, or all the part inside the ship.

Hounding.—From the upper deck, up to where the rigging is placed (Fig. 120).

Mast head.—From where the rigging is placed, to the top of the mast (Fig. 120).

Cheeks.—The side pieces for the trestletrees to rest upon (Fig. 120).

Hounds.—The flat horizontal surface of the upper part of the cheeks.

Knees.—Projecting forward on each side of the hounds, to support the fore part of the trestletrees immediately under the topmast (Fig. 121).

Trestletrees.—Two fore-and-aft pieces, one on each side of the mast, resting on the hounds, to support the rigging and the upper masts (Figs. 120, 121).

Crosstrees.—Two cross pieces on top of the trestletrees, to spread the rigging of the upper mast (Figs. 120, 121).

Top.—Rests upon the lower crosstrees and trestletrees; spreads the topmast rigging, and for the convenience of men working aloft (Figs. 120, 121, 232).

Sleepers.—Two cross pieces over the top, to secure it down to the crosstrees and trestletrees.

Cap.—On a masthead or bowsprit end, to support the upper mast or jib-boom in its proper position (Figs. 120, 121).

Capshore.—A support under the fore part of a lower cap (Fig. 240).

Wedges.—Between a mast and the partners of the deck, to keep it upright in its place.

Masthead battens.—On the masthead, to protect the eyes of the rigging from being cut by the hoops (Figs. 117, 236).

Bed of bowsprit.—The part of the stem on which the bowsprit rests.

Bees of bowsprit.—Chocks of wood on each side of the bowsprit, between the rigging and the cap, for the fore topmast stays to reeve through.

Saddle of jib-boom.—A chock of wood on top of the bowsprit inside the rigging, to fix the heel of the jib-boom in, and keep it steady in its place (Fig. 160).

Saddle of spanker-boom.—A support on the mizen trysail mast for the jaws of the spanker-boom to rest upon.

Jaws.—Two cleats on the inner end of a gaff or boom, forming a semicircle to keep it in its place resting against the mast.

Lightning conductor.—A double strip of copper on the after side of each mast, and underneath the bowsprit and jib-boom; they are connected with a copper bolt through the keel, or led along under a beam on the lower deck, through the ship's side, and down to the copper on the bottom of the ship.

There is a tumbler on each cap to connect the conductors of the two masts together. The conductor on the bowsprit is carried down the stem of the ship without coming inboard.

Bolsters.—Two blocks of wood, one on each side, filling up the angle between the top of the trestletree and the masthead, to prevent the rigging being cut against the outer edge of the trestletree (Fig. 116).

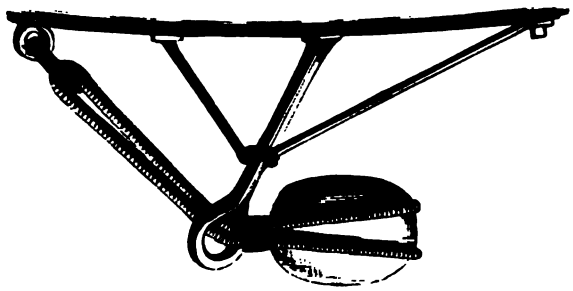
Rubbing paunch.—A batten up and down the forepart of a lower mast, to keep the lower yard clear of the hoops when going up or down.

Heel.—The lower end of a spar.

Head.—The upper end of a spar.

A SPIDER—FID OF TOP-GALLANT MAST.

10



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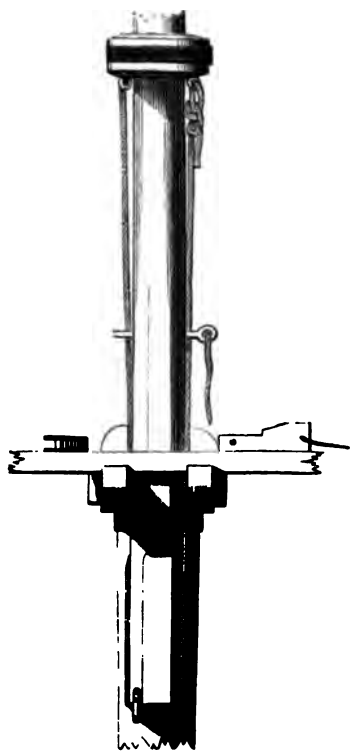

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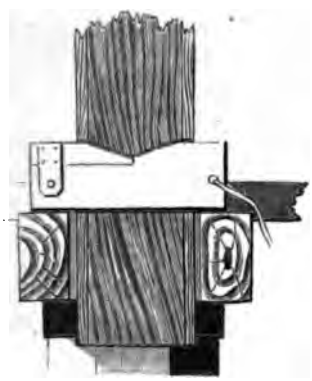
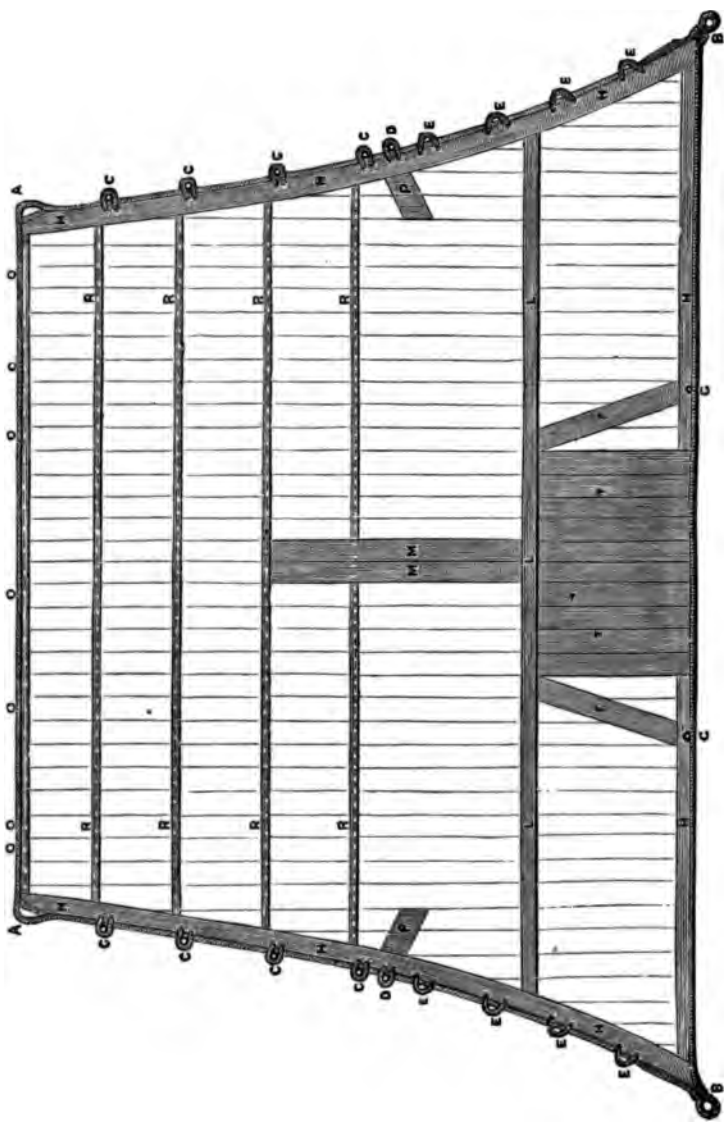


A TOPSAIL.



Fid-hole.—A hole in the heel of a topmast or top-gallant mast for the fid (Fig. 10 *b*).

Fid.—A bar of iron or wood put through the fid-hole of a mast, and across the tressletrees, to support a topmast or top-gallant mast (Fig. 10 *b*, 10 *c*). The fid of a top-gallant mast is formed of two wedge-shaped pieces of wood, forced into the fid-hole from opposite sides, and then being connected together, the fid cannot be jerked out by the pitching of the ship.

Yard-arm.—The ends of a yard where the rigging is placed (Figs. 130, 134).

Slings.—The middle of a yard where the rigging is placed (Figs. 131, 133, 135).

Quarter.—Between the slings of the yard and the yard-arms (Figs. 129, 132, 134).

Boom-irons.—On the jib-boom, and the lower and topsail yards, to support the flying jib-boom and the studding-sail booms.

PARTS OF A SAIL.

A cloth.—A whole strip of canvas; they measure from eighteen inches to two feet in breadth.

Head.—The top of a sail (Fig. *aa*, 11).

Leech.—The side (Fig. *ab*, 11).

Luff.—The weather leech, or the side first touched by the wind (Fig. *nk*, 14).

Foot.—The bottom or lower edge (Fig, *bb*, 11).

Clews.—The two lower corners of a square sail, and the after lower corner of a fore and aft sail (Figs. *b*, 11, 12, 13, 14).

Tack.—The foremast lower corner of a fore and aft sail; also, the rope attached to the foremost lower corner of a course (Figs. *k*, 13, 14).

Sheets.—The ropes which spread the lower corners of a square sail (with the exception of the courses), and the after lower corners of a course or fore and aft sail (Fig. *b*, 14).

Peak.—The upper and aftermost corner of a spanker or trysail (Fig. *a*, 14).

Throat or Nock.—The upper and foremost corner of a spanker or trysail (Fig. *n*, 14).

Bunt.—All the middle cloths of a square sail.

Bolt-rope.—The rope sewed round the sides of a sail.

Cringles.—A strand of rope worked round and into the bolt-rope, for the reef earings, bowline bridles, and reef tackle pendants (Fig. *ce*, 11, 214).

Robands.—Pieces of sennit plaited round the head rope of the sail, for securing it to the jackstay on the yard (Fig. 20).

Head earings.—Ropes spliced into the head cringles, to secure them to the yard-arms (Fig. 248).

Reef earings.—Ropes used in combination with points or beckets to secure the sail to the yard when reefs are taken in (Figs. 253, 254).

Tabling.—The double part of a sail, close to the bolt-rope (Fig. *h*, 11).

Eyelet-holes.—Holes formed in the tabling and reef-bands, for the robands, reef-lines, buntline toggles, and cringles.

Bowline bridles.—Are used to flatten the surface of a sail when it is set.

Buntlines.—Ropes secured to the foot of a sail, and used when taking it in or in reefing.

Reeftackles.—Ropes attached to the leeches of topsails and courses, and are used in reefing (Fig. 249).

Clewlines.—Ropes attached to the clews of all square sails, and are used when taking them in (Fig. 210).

Buntline cloth.—Double part of a sail to take the chafe of the buntline (Fig. *f*, 11, 12).

Reeftackle patch.—Double part to take the strain of the reeftackle (Fig. *p*, 11).

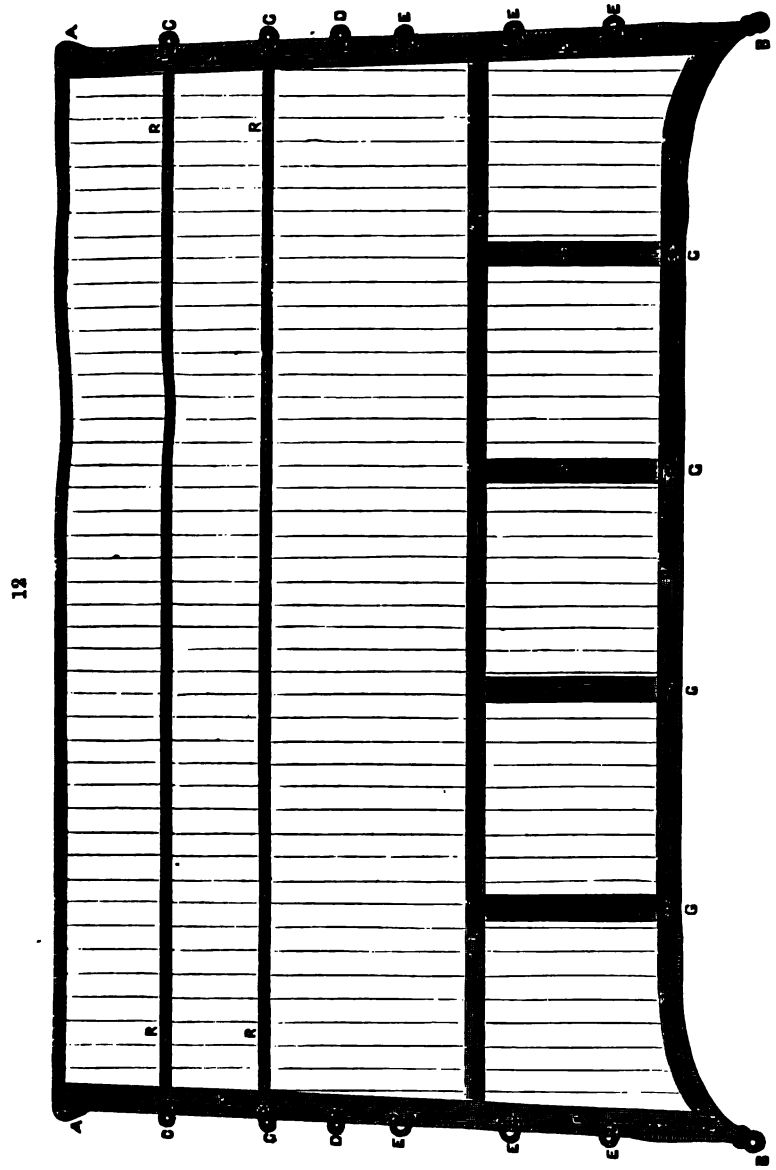
Reef bands.—Double part across a sail for working the eyelet-holes for the reef lines or points in each reef (Fig. *r*, 11).

Belly band.—Double part across a topsail below the fourth reef for strength (Fig. *l*, 11).

Top lining.—Double part on the after side of a topsail, to take the chafe of the top, &c. (Fig. *t*, 13).

Goring cloth.—Any cloth cut obliquely, as those in a jib, or the side cloths of a topsail, &c. (Fig. 13).

A COURSE.



A JIB.

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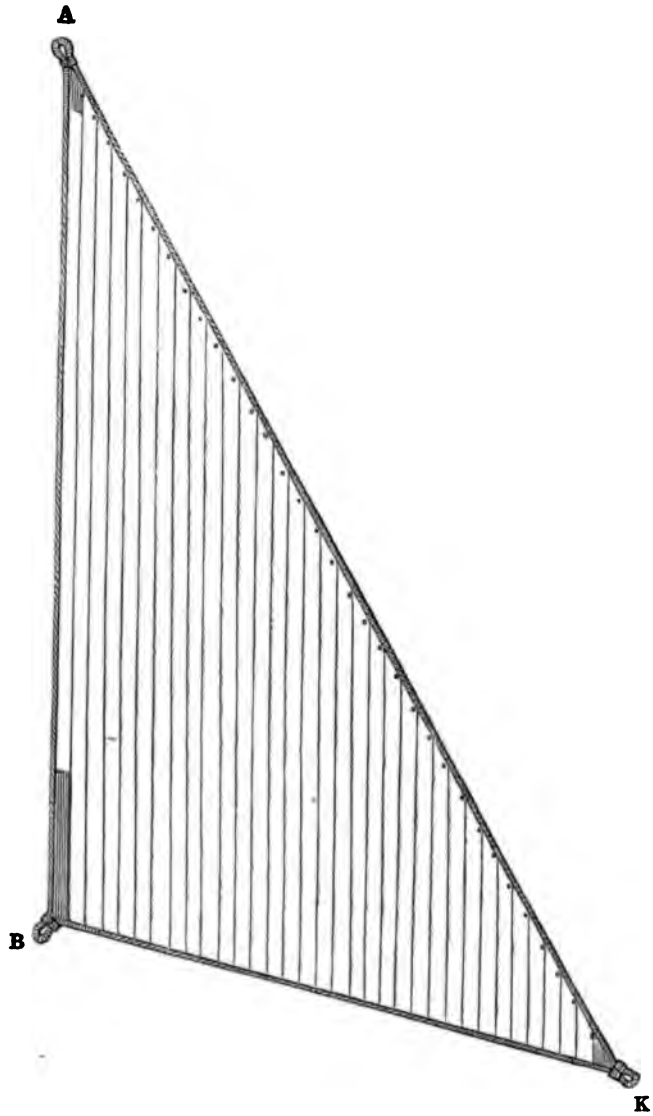

A SPANKER.

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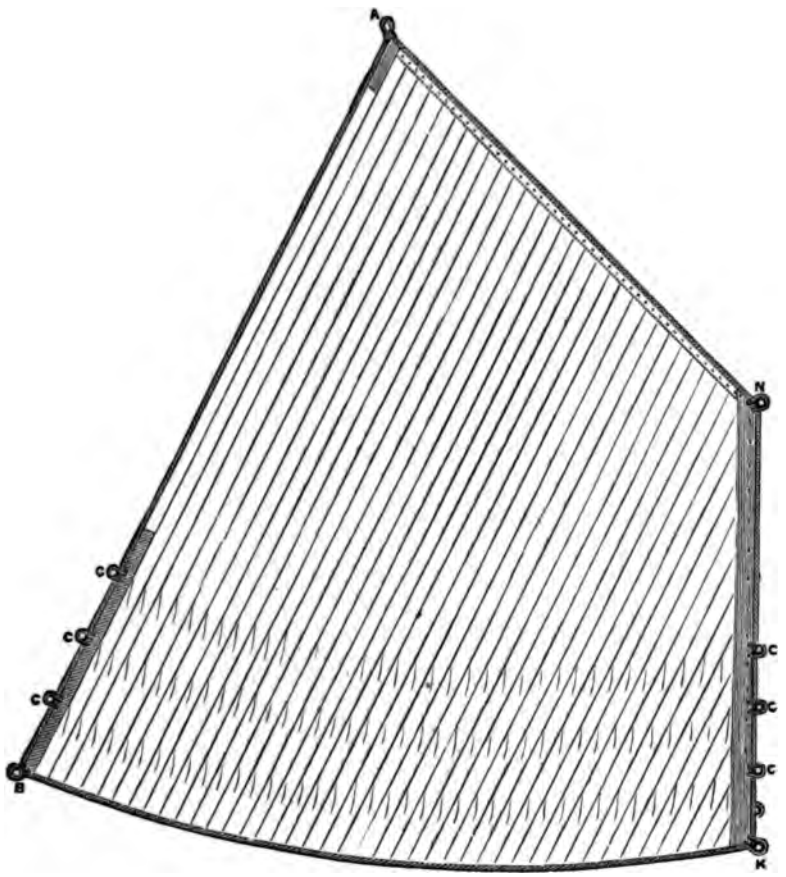

Roach.—The curve in the foot of a sail (Fig. 12).

Slab.—Any slack part of a sail hanging down.

A square sail is roped on the after side, and a fore and aft sail on the port side; always bend a sail with the rope, between the sail and the yard or gaff.

Canvas is manufactured from the finest flax, in two different breadths of 18 inches and 2 feet; and 8 thicknesses, No. 1 being the stoutest. It is made up in bolts, 40 yards long.

Why has each mast so many more ropes to support it sideways and aft than it has to support it forward?

Because the force of wind on the sails blows the mast forward.

In consequence of having so few stays, it is not prudent to back a square sail (causing the wind to blow against the foremost side of it) when blowing hard.

Why should not masts be supported sideways only by shrouds?

If the backstays were shortened into shrouds, they would have to be secured aloft, and therefore cause the tops and crosstrees to be much larger and heavier.

Why should not masts be supported sideways only by backstays?

If the present shrouds were continued down to the channels as backstays, they would prevent the yards bracing forward, unless those on the lee side were let go.

Why are there no studding sails on the mizenmast or on each side of the mainsail?

To drag a weight, it is kept steadier (steered better) if the rope by which it is moved is secured to the foremost end; therefore, a ship, when sailing away from or before the wind, is steered easier when the most sail is forward. Studding sails on the mizenmast, or on either side of the mainsail, would keep the wind from blowing into the sails forward. But main-topmast and top-gallant studding sails are very useful when the wind is not quite aft, as they catch the wind which would otherwise escape between the fore and main-topsails, and top-gallant sails. The yards on the mizenmast cannot be supported from abaft as the other yards, and therefore are unable to carry studding sails when the wind is abeam.

What is the use of a trysail mast being placed abaft a lower mast?

The jaws of a gaff or boom cannot work on a built mast, on account of the iron hoops, and the mast not

being circular; a trysail mast is therefore placed immediately abaft each built lower mast for them to work upon.

THE STANDING RIGGING.

To steady and secure a spar it must have at least three separate supports.

A rope supporting any mast from forward is called a *stay* (Fig. 245).

Shrouds.—Are the side supports which go from the top or head of a mast to some place in a line with the bottom or foot (Fig. 121).

Backstays.—Are those going from the head of any of the upper masts down to the sides of the ship (Fig. 121).

Guys.—Are the side supports of a boom.

The bowsprit is supported downwards by *bobstays* (Fig. 154), and sideways by *shrouds*.

The jib-boom is supported downwards by a *martingale* (Fig. 154), and sideways by *jib-guys*.

The flying jib-boom is supported downwards by a *flying martingale* (Fig. 157), and sideways by *flying guys* (Fig. 154).

Each stay, shroud, backstay, and guy has the same name as the spar which it supports; thus, those supporting the main-top-gallant mast are, the *main-top-gallant stay*, *main-top-gallant shrouds*, and *main-top-gallant backstays*.

Gammonings of the bowsprit (Figs. 154, 157).—Two chain lashings to secure the bowsprit down in its bed.

Futtock shrouds (Figs. 120, 121).—Chain or rope shrouds, connecting the topmast rigging to the necklaces on the lower mast.

Lanyards of rigging (Figs. 123, 124).—A smaller rope, used for securing the end of any part of the rigging.

Masthead pendants (Fig. 120).—Short pieces of rigging hanging from the lower mast-heads; they are used in combination with tackles to get the mast into its right position (*staying the mast*), and for setting up the lower rigging, &c.

Burton pendants (Fig. 120).—Hang from the topmast head for setting up the topmast rigging.

Ratlines (Fig. 204).—Small ropes hitched across the shrouds to form ladders.

Back ropes.—Continuations of the jib-martingale from the dolphin striker to the ship's side (Fig. 154).

Jumper } Continuations of the jib guys from the spritsail
After jib guy } gaffs to the ship's side.

Heel chain (Fig. 160).—A chain led from the bowsprit cap round the heel of the jib-boom to keep it out in its place.

Crupper chain (Fig 160).—A chain passed round the bowsprit and the heel of the jib-boom to secure the latter down in its saddle.

Jackstay (Fig. 134).—A rope stretched along the top of a yard, for the sail to be bent to.

Footrope (Fig. 134).—A rope hanging under a yard, or boom, for the men to stand upon.

Stirrups (Fig. 134).—Short pieces of rope hanging from the lower and topsail yards to support the footropes.

Flemish horses (Fig. 132).—A short footrope hanging under the yardarms of the lower and topsail yards.

Parral (Figs. 131, 133, 138, 140).—A rope to secure the topsail, top-gallant and royal yards to their respective masts.

Truss (Figs. 135, 142, 143).—A working parral, to secure a lower yard to its mast.

Slings of a yard (Figs. 135, 153).—A chain, or rope, supporting the centre of a yard.

BENDS AND HITCHES.

FIG.

15. Half hitch.
16. Timber hitch. For securing the end of a rope to a spar, &c.
17. Half hitch and timber hitch. For towing a spar.
18. Clove hitch. For securing ratlines, &c.
19, 20. Roband hitch. For securing the robands or ropebands of a sail to the jackstay.
20B. Rolling hitch. For putting a tail jigger on a rope, &c.
21. Fisherman's bend. } For securing a hawser to the
22. Round turn and half hitch. } ring of an anchor.
23. Studding-sail halliard bend. For bending halliards to a yard.

24. Blackwall hitch.
25. Double Blackwall hitch.
26. Marling-spike, or Midshipman hitch.
27. Catspaw.

} For hooking a tackle to a rope.

28. Bowline.
29. Running bowline. Forming a noose to put over anything.
30. Bowline on the bite. For lowering a man from aloft, &c.
31. Single or sheet bend.
32. Double bend.
33. Reef knot.

} For bending ropes' ends together.

34. Sheepshank. For shortening a rope.
35. Figure of eight. A knot in the end of a rope to prevent its unreaving.
36. Carrick bend.
37. Two bowlines.
38. Half hitch and seizing.

} For bending hawsers together.

39. Pass a stopper. For securing a rope whilst it is being belayed.
40. Marling hitch. A jambing hitch.
41. Rope-yarn knot. For tying yarns together, leaving the knot as small as possible.
42. Mouse a hook. To prevent a tackle unhooking.
43. Slink a cask on its end.
44. Butt slings.
45. Bale slings.
45B. Can hooks.
46. Use a parbuckle.
47. Put a strop on a rope.
48. Put a strop on a mast.
49. Inside clinch.
50. Outside clinch.

} For securing the standing part of a rope.

An inside clinch is the most secure; an outside clinch depends alone on the seizings and is only used where an inside clinch would be liable to jamb.

LEAD LINE.

A lead line is used for ascertaining the depth of water. The lead is usually hove forward from the main chains, and the soundings are taken as the ship passes the spot where it entered the water. The lead is from 7 to 14lbs. weight (Fig. 51), and the line from 20 to 25 fathoms long.

The measurement commences at the bottom of the line, which is marked with

BENDS AND HITCHES.

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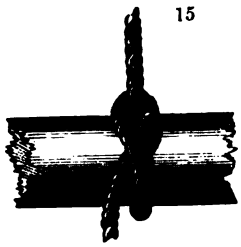

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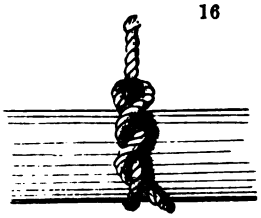

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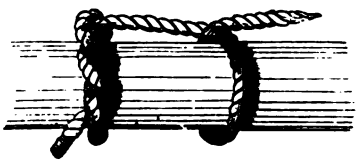

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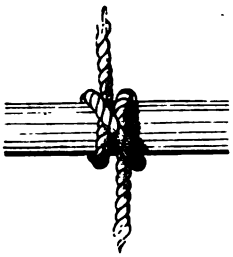

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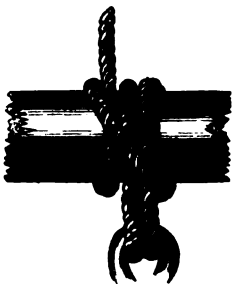

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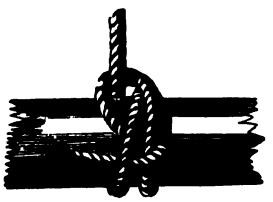

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BENDS AND HITCHES.

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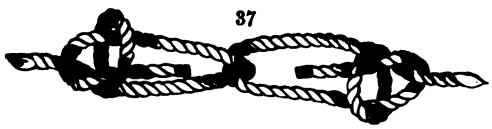

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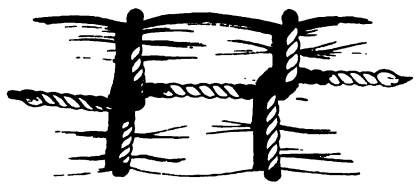

CASK SLINGS, &c.

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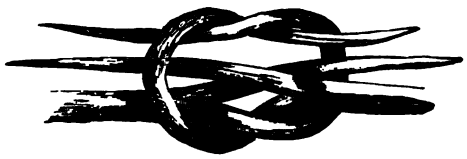

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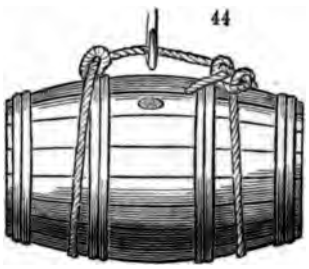

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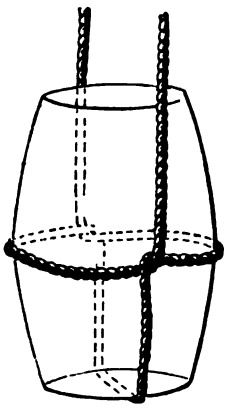

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45 B

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A piece of leather at 2, 3 and 10 fathoms.
White bunting at 5 and 15 „
Red bunting at 7 and 17 „
Blue bunting at 13 „
And with two knots at 20 „
Each fathom that is not marked is called a *deep*.

MARKS. *Fathoms.*	DEEPS. *Fathoms.*
	1
2 a piece of leather with 2 strips	
3 a piece of leather with 3 strips	
	4
5 white	
	6
7 red	
	8
	9
10 a piece of leather with a hole in it	
	11
	12
13 blue	
	14
15 white	
	16
17 red	
	18
	19
20 two knots.	

In calling the soundings, if the depth of water alongside corresponds with any mark, the leadsman calls "*by the mark 5 or 7, &c.;*" if he judges that the depth corresponds with a deep, "*by the deep 8 or 9, &c.;*" if ¼ or ½ a fathom more than a mark or deep, "*and a quarter 7 or 8, &c.,*" or "*and a half 7 or 8, &c.;*" if ¼ of a fathom less, a quarter less 7 or 8, &c.

A deep sea lead line.—Is from 100 to 200 fathoms long, with a lead weighing from 28 to 30 pounds. It is marked the same as a hand lead line up to 20 fathoms, then with one knot at 25 fathoms, three knots at 30, one knot at 35, four knots at 40, and so on to 95. Then at 100 fathoms a piece of bunting, at 105 one knot, at 110 a piece of leather, at 115 one knot, at 120 two knots, and so on, as in first 100 fathoms. The bottom of the lead is hollowed, for the purpose of being *armed* (filled with tallow) to ascertain the nature of the ground.

In sounding with the deep sea lead, the ship is "hove to;" the lead line is carried forward on the weather side, outside

everything, from the quarter to the cathead or bumpkin, where it is bent to the lead; a number of men are stationed to hold the line clear of the ship's side, and to take the sounding, in case the lead reaches the bottom sooner than is expected; they each have a small coil of the line in their hands, so as not to check the lead as it is going down. The quantity of line to be hauled off the reel and passed forward depends upon the supposed depth of water.

The lead is hove overboard forward, and as each man attending the line feels it tauten, and is sure the lead has not reached the bottom, he flings his coil overboard, passing the word to the next man aft, by saying, "*Watch there, watch.*" If it has not reached the bottom before, the sounding is taken by the quartermaster, on the weather quarter, with the line as nearly up and down as possible.

The most correct soundings are taken by Massey's sounding machine (Fig. 52).

The register wheels are first set at the starting points, the small one at the 10 fathom mark, and the large one on the opposite side at the 150 fathom mark; the shield or catch is then shut down on the fan, the lead is hove overboard forward as before; on the lead entering the water, the action of the water lifts the catch up and turns the fan, which motion is communicated to the register wheels.

Immediately the lead reaches the bottom, the fan ceases to revolve, and on the line being hauled in, the action of the water presses the catch down on the fan and locks it in its position.

The depth of the water in fathoms is shown by the register wheels.

LOG LINE.

A log line is used to ascertain the velocity of a ship through the water. The *log-ship*, a piece of wood in the shape of a sector of a circle, with the arc weighted, and fitted with two lines to enable it to swim square and upright in the water (Fig. 53), is fastened to the end of the line. One of the lines is fitted with a peg to draw out. On the *log-ship* being thrown overboard, it catches the water

SOUNDING LEAD—LOG SHIP.

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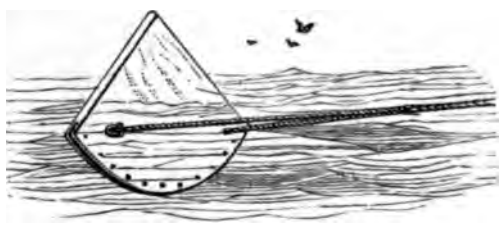

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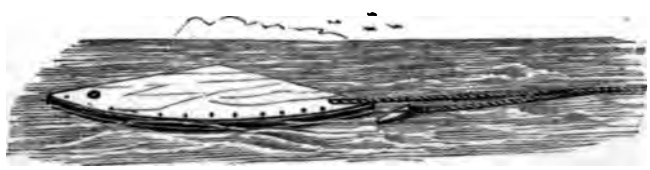

MASSEY'S SOUNDING MACHINE.

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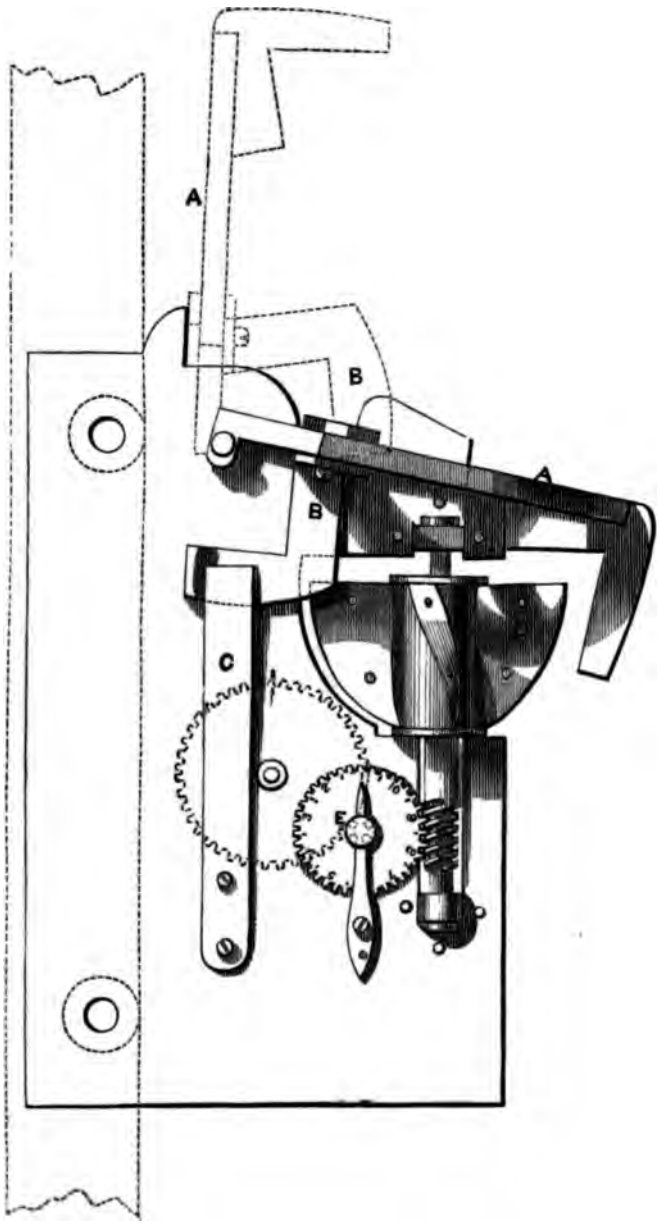


and remains stationary, and as the ship moves ahead away from it, the line is pulled off the reel; a sufficient quantity of stray line is allowed to run away to enable the log-ship to get proper hold of the water before the measurement begins.; a piece of white bunting is placed to mark the end of the stray line, and the commencement of the knots.

The length of each knot must be the same part of a sea-mile as the sand-glass is of an hour. It is usually calculated to correspond with a glass running 28 seconds. If the ship is going very fast through the water, a 14 second glass is used, when the distance shown on the log-line must be doubled. The line is marked with

One knot at every half-mile,
A piece of leather at the first mile,
Two knots at two miles,
Three knots at three miles,
Four knots at four miles, and so on.

TO HEAVE THE LOG.

The glass is first ascertained to be clear; the log-ship, and sufficient line to enable it to fall clear into the water, is then hove over the lee quarter; the line is allowed to run off the reel, with an occasional help, so as not to allow the log-ship to be pulled through the water after the ship; when the piece of white bunting at the end of the stray line passes over the quarter, "*turn*" the glass; when the glass has run out, "*stop;*" the line is checked, and the nearest marks will show the velocity of the ship per hour in knots. The pressure of the water on the log-ship then causes the peg fitted to one of the lines (Fig. 54) to come out, when the log-line is easily hauled on board.

To calculate the length of a knot on the log-line:—

$$\frac{\text{1}}{\text{3600}}\ \text{sec.} : 28 :: \frac{\text{1}}{\text{2027}}\ \text{yards} : \text{length of line.}$$

$$\frac{28 \times 2027}{3600} = \frac{14189}{900} = 15{\cdot}7 \text{ yds.}$$

The most correct way to ascertain the distance run by a ship is by means of Massey's patent log (Fig. 55).

A towing line is used sufficiently long to take the log clear of the eddy in the wake of the ship.

See the register wheels set at the starting points, which are respectively 1, 10, and 100.

Tow the log overboard from the weather quarter.

As the ship tows the log, the fan is turned by the action of the water, which motion is communicated to the wheel work by means of the connecting cord.

When the log is hauled on board, the distance run is read off from the register wheels.

There are 1760 *yards in a land mile, and* 2027 *in a sea mile or knot; why is there any difference?*

A land mile is measured without any reference to the size of the earth.

A sea mile is the number of yards contained in the circumference of the earth at the equator, divided by 21,600 ($360° \times 60$) the number of minutes in a circle, or the sixtieth part of a degree on the equator.

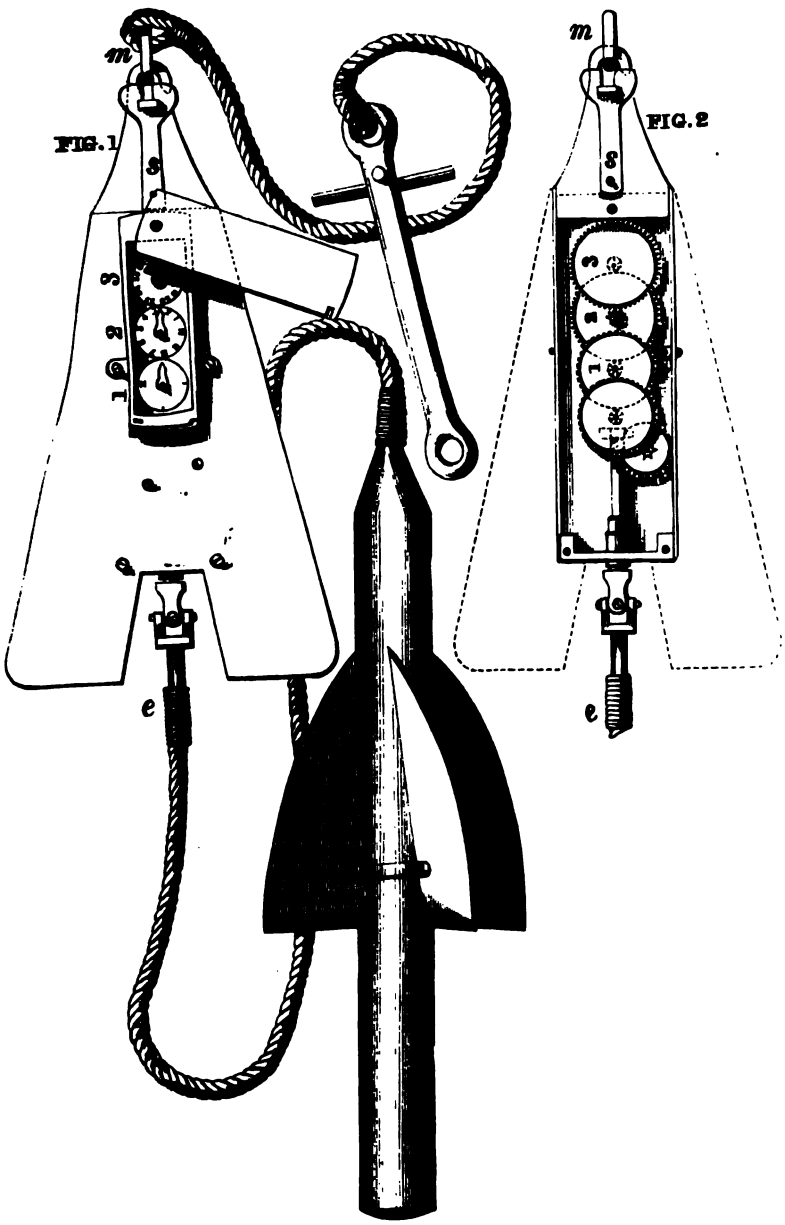
FIRST PART—RUNNING RIGGING.

Halliards.—Are used to hoist a sail on its respective mast or stay, they are led from the sail to the mast-head.

Sheets.—Are used to spread the foot of a sail. In a square sail, they lead down from the clews to the yard-arms immediately below them. In a course, they lead from the after clew down to the ship's side. In a jib or staysail the after-clew has two sheets, one leading to each side of the ship.

Tacks.—Are used to confine the foremost clew of a course, they lead from the clews of the foresail to the bumpkins, and from the clews of the mainsail to the maintack cavil in each waist. The courses have a tack and sheet secured to each clew, the tack is always used on the weather side, and the sheet on the lee side of the ship.

Braces.—If the wind was always blowing exactly aft, the yards might be fixed at right angles to the ship; but when the


m
FIG. 1
s
e
e
e
m
FIG. 2
s
e

wind is blowing against the side, the sails and yards must be braced up to allow the wind to strike them at a larger angle. Braces are therefore used to move the yards horizontally into the required position.

A square sail being secured at the two bottom corners, to the yard immediately below it, evidently brings a great strain on the yard-arms, bowing them forward and upwards—in order to support them, the braces are led, if possible, from the yard-arms, aft and downwards.

Lifts.—Are used to support the yard-arms. They lead from the yard-arms up to the mast-head.

Clewlines.—In taking in a square sail, a clewline is used to pull each clew up to the quarter of its own yard.

Clewgarnets.—In taking in a course, a clewgarnet is used to pull each clew up to the quarter of its own yard.

Buntlines.—In taking in a square sail, buntlines are used to pull the foot of the sail up to or a little above the yard.

Leechlines.—In taking in a course, leechlines are used to pull the leech of the sail up to the yard on the foremost side.

Slablines.—After a course is taken in, slablines are used to confine the slack sail which would otherwise hang down below the yard.

Reeftackles.—Are used to haul the leech of the sail taut up to the yard-arms in reefing, and thus lighten the sail for the men on the yard.

Bowlines.—After a sail is hoisted and the yard braced up, the bowline is used to drag the weather-leech further forward, thus tautening the luff, and flattening the surface of the sail as much as possible.

Brails.—Are used in taking in a spanker or trysail, they lead from the after-leech of the sail up to the gaff or trysail mast on both sides.

Vangs.—Are for steadying a gaff when the sail is brailed up.

Downhauls.—Are for hauling down a jib or staysail.

Outhaul.—Is used to haul the spanker out to the end of the boom, and sometimes to haul a trysail out to the end of the gaff.

In running rigging, all single ropes are secured to the yard or sail that is to be moved, led through a sheave or a block secured at the place towards which it is required to move it, and then down on deck.

To gain more power, or to lighten the strain on a rope, it is doubled, trebled, and sometimes rove with four or more parts.

To double a rope.—Cast off the standing part from the yard or sail, secure a block in its place, reeve the rope through it, and make fast the standing part close to the block already secured at the place towards which it is required to move the yard or sail.

With any odd number of parts of rope in a purchase, the standing part is secured to the yard or sail.

With an even number the standing part is secured at the place towards which the yard or sail is to be moved.

As the strop of a block is only supposed to bear the strain of a rope rove through it, the standing part, should, if possible, be secured to a separate place.

ROPES USED IN SETTING AND TAKING IN SAILS.

In setting—

Courses—let go the slablines, leechlines, buntlines and clew-garnets—haul upon the weather tack and lee sheet.

Topsails—let go the buntlines and clewlines—haul upon the sheets and halliards.

Top-gallant sails—let go the buntline and clewlines—haul upon the sheets and halliards.

Royals—let go the clewlines—haul upon the sheets and halliards.

Jib—let go the downhaul—haul upon the halliards and sheet.

Spanker—let go the brails—haul upon the outhaul.

In taking in—

Courses—let go the weather tack and lee sheet—haul upon the clewgarnets, buntlines, leechlines, and slablines.

Topsails—let go the sheets and halliards—haul upon the clewlines and the buntlines.

Top-gallant sails—let go the sheets and halliards—haul upon the clewlines and buntline.

Royals—let go the sheets and halliards—haul upon the clewlines.

SPLICES.

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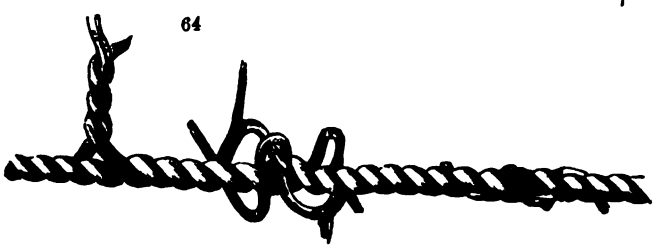

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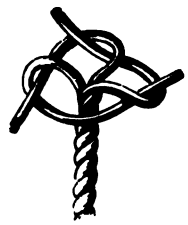

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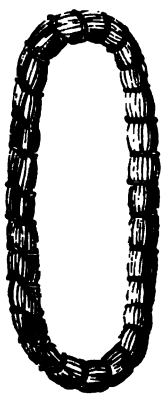

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FLEMISH EYE—SEIZINGS.

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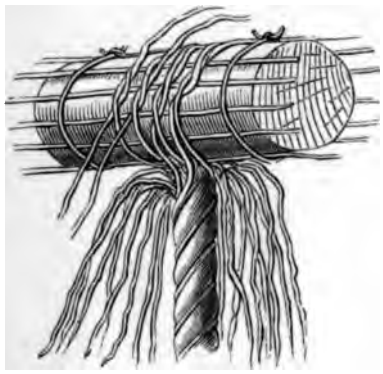

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SEIZINGS AND LASHINGS.

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86

Jib—let go the halliards and sheet—haul upon the downhaul.

Spanker—let go the outhaul—haul upon the brails.

NOTE.—Braces, lifts, bowlines, and vangs, have not been mentioned.

KNOTS AND SPLICES.

Eye splice (Figs. 56, 57, 58, 59, 60, 61).—For the eye of all single ropes.

Short splice (Figs. 62, 63).—For joining two ropes, stropping blocks, &c.

Long splice (Fig. 64).—For splicing running rigging.

Grummet (Fig. 65).—A neat strop for blocks, &c.

Wall knot (Fig. 66).—Finishing off seizings; forming a shroud knot, &c.

Shroud knot (Fig. 67).—Knotting shrouds, &c.

Stopper knot (Figs. 68, 69).—Deck stoppers.

Matthew Walker (Figs. 70, 71).—For securing the standing part of a rope, &c.

Selvagee strop (Fig. 72).—Is not so liable to slip as a common strop.

Standing turk's-head (Fig. 73).—On the footropes of jib-boom, &c.

Flemish eye (Figs. 74, 75).—For the lashing eyes of stays.

SEIZINGS, LASHINGS, &c.

Flat seizing (Fig. 76).—A light seizing.

Throat seizing (Figs. 77, 78, 79, 80, 81).—For block strops, and seizing rigging where the strain comes on both parts of the rope.

Racking seizing (Figs. 82, 83).—Seizing wire rigging, or where the strain is only on one part of the rope.

Rose lashing (Figs. 84, 85).—Lashing the eyes of all rigging, &c.

A *rose seizing* is used to secure rigging with a single eye, flat on a spar; such as the inner ends of the foot ropes on upper yards (Fig. 85).

Form a half crown (Fig. 98).—Fitting backropes, &c.

Whip a rope (Fig. 86).
Point a rope (Fig. 86*b*). } To preserve the end of a rope.

Marl down (Fig. 75.)—To prepare the ends of a splice before serving.

Make a fox.—For making gaskets, mats, rackings, temporary seizings, &c.

Make a nettle.—For hammock clews, seizings, &c.

French sennet.—For furling gaskets.

Paunch mat.
Sword mat. } For chafing mats.

Worm (Fig. 87).
Parcel (Fig. 88).
Serve (Fig. 89). } To preserve a rope from wet or a chafe.

Spanish windlass (Fig. 90).—A purchase for heaving two ropes together.

Studding sail hailliard strop (Figs. 91, 92).—For bending studding sail hailliards to the yard.

In stropping blocks, with a thimble once and a half the round of the block will allow rope enough for the strop if single. For double strops take twice the round of block thimble and rope, and allow end for splicing. In stropping with a grummet, the strand should measure four and a half times the round of the block.

Before passing a seizing over a rope that has been served, a strip of tarred canvas is put on, to keep the turns of the seizing from opening the service.

All ropes are parcelled with the lay.
The lowest part of the rope is parcelled first, and work up, like tiling a house, so that the wet may run down without getting between the parts of the parcelling.

All ropes are served against the lay, as the service lies much closer.

TO SPLICE AN EYE IN A THREE-STRANDED RIGHT-HANDED ROPE.

Bend the end of the rope down, having first opened the strands (as in Fig. 56), leaving the middle strand on top of the rope.

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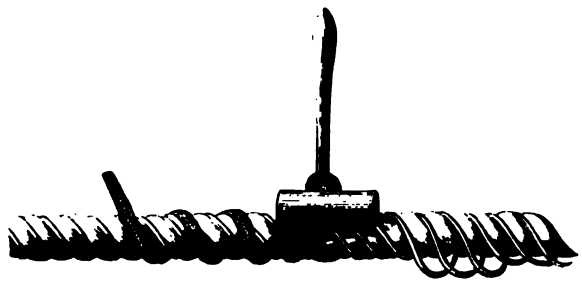

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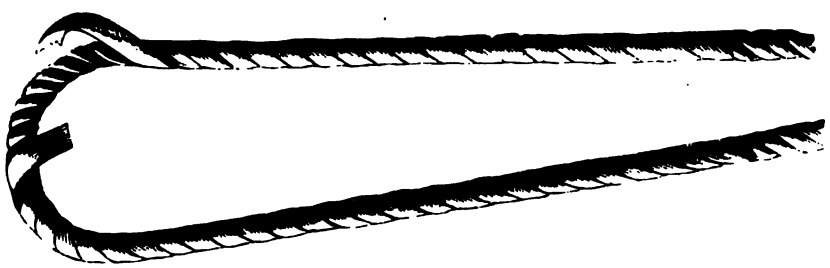

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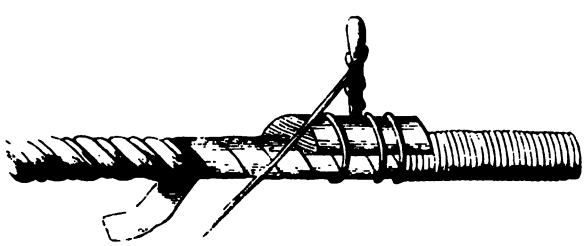


The middle strand is forced under any convenient strand in the rope (according to the size of the eye required), from right to left (as in Fig. 57).

The left-hand strand is then forced from right to left, over one strand and under the next on the left (as in Fig. 58).

Now turn the rope round to the left, so as to bring the remaining or right-hand strand on top of all (as in Fig. 59).

The right-hand strand is then forced from right to left under the strand of the rope immediately on the right of the one the first or middle strand was placed under (as in Fig. 60).

In placing this strand, if a half turn is taken out of it, it will lay closer.

In completing the splice it is immaterial which strand is used first, as each is taken over one strand of the rope, and under the next one.

In large ropes each strand is halved before being spliced in to form the second layer.

In a left-handed rope the strands are put in from left to right.

TO SPLICE AN EYE IN A HEMP OR WIRE ROPE WITH MORE THAN THREE STRANDS.

The second strand from the left is forced from right to left under any convenient strand, as in Figs. 57 and 61.

The left-hand strand is then forced under the same strand, and also under the next one on the left, thus laying under two strands, then turn the rope over as in Fig. 59—work each of the remaining strands in as the right-hand strand of the three-stranded rope (Fig 60), working round towards the right hand—each strand is then halved and the splice finished as before.

With a five-stranded rope, the centre strand of the five is forced under the most convenient strand, then the next strand on the left under one, and the left-hand strand of all under two strands, as in Fig. 61, then the two right-hand strands as before.

In splicing wire rope, as soon as one layer is finished a temporary seizing of spun yarn must be put round everything before dividing the strands, ready for the next layer.

Each strand is put in three times in order to taper the splice down better.

ROPE MAKING.

	What made from.	*How laid up.*
Yarns.	Hemp.	Right handed.
Strands.	Yarns.	Left or right handed.
Hawser laid rope (Fig. 92 *b*).	3 strands.	Opposite way to the strands.
Shroud laid rope (Fig. 92*c*).	4 strands and a heart.	Right handed.
Cable laid rope (Fig. 92*d*).	3 hawser laid ropes.	Left handed.
Spunyarn.	3 to 9 yarns.	Right handed.
Sennit.	Yarns.	Plaited.
Nettle stuff.	2 or 3 left-handed yarns.	Right handed.
Foxes.	Short yarns laid up by hand.	Left handed.

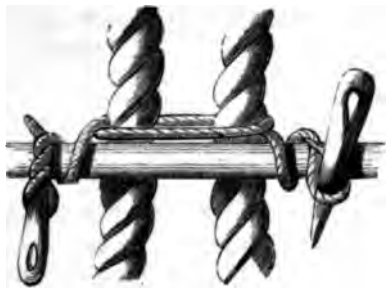
Rope is measured by its circumference, and is laid up 113 fathoms long, and in different sizes, up to 28 inches; it is made up in coils up to 5 inch; above that it is sent on board in the length.

	Made from.	*Use.*
Twine is made from the finest hemp.		
Coir rope.	Cocoa-nut fibres.	As this rope floats, it is very useful for warps.
Hide rope.	Hide.	Wheel ropes; this is much stronger than hempen rope, but it must be kept dry and well greased, as when wet it swells and shrinks.
Junk.	The best condemned rope sent on board unlaid.	For seizing stuff, spunyarn, sinnet, mats, swabs, &c.
Rounding.	Smaller rope, condemned.	Wads, &c.

89 B

SPANISH WINDLASS, &c.

90

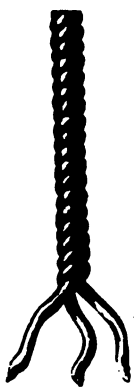


90 B

91

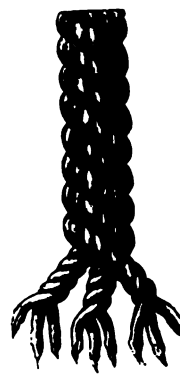
92

92 B



92 C

92 D



	Made from.	*Use.*
Oakum.	Old yarns picked into hemp.	For caulking.
Rhumbow-line.		Soft rope for nippers, &c.

Running rigging is hawser laid, right handed.

Gun gear is hawser laid, left handed.

Standing rigging is shroud laid.

Three times the size of the rope will give the size of the block through which it will reeve.

Why has a four stranded rope a heart in the centre?

To make the strands lie evenly: if there were no heart, the rope would have a hollow in the centre. The greater number of strands a rope has, the larger will be the hollow, and consequently the heart.

Why is gun gear laid up left handed?

The yarns being spun right handed, and the strands being also laid up right handed, make the rope much softer and more pliable, but it has the disadvantage of being more liable to soak up wet.

FITTINGS OF THE STANDING RIGGING.

THE EYE SPLICE (Figs. 57 and 93).

The simplest way to make fast a rope to support a spar, is by splicing an eye in the end of the rope, and placing it over the spar.

FORK AND LASHING EYES (Fig. 94).

In some cases, an eye splice cannot be placed over a mast head. A fork and two lashing eyes are then fitted, and the eyes are lashed together behind the spar.

(A fork with lashing eyes is the same as an eye splice with the centre cut and the two parts lashed together again).

CUT SPLICE (Fig. 95).

If two ropes, one on each side of a spar, are fitted with eye splices, there will be two ropes round the mast head.

By splicing each rope into the other to form a cut splice, there will be only one; but this fitting is not good, and must not be used for any of the principal ropes, on account of the strain which is brought on the back of the opposite splice.

THROAT SEIZING ON THE BIGHT (Fig. 96).

When there are a number of ropes supporting a spar, as many as possible are fitted in pairs; the middle or bight of the rope is placed over the end of the spar, and a seizing is put on to form an eye.

Thus, with an even number of ropes, they are all fitted in pairs, with throat seizings on the bight.

With an odd number, they are all fitted in the same way except the odd one, which being a single rope, is fitted with an eye splice.

HORSE SHOE (Fig. 97).

Immediately that a rope is bent it becomes weaker, therefore all rigging should be kept as straight as possible.

In some cases, the two legs of a pair of shrouds, &c. are required to be taken well apart from each other. If fitted with a throat seizing on the bight round the mast head, too much strain would be brought on the seizing, besides bending the rope. Therefore a short piece of rope is spliced into each leg, to act instead of a seizing, forming a horse-shoe splice.

HALF CROWN (Fig. 98).

Another way of fitting rigging, when the legs are spread well apart, is by crossing the ends, and seizing them at the cross, to form an eye.

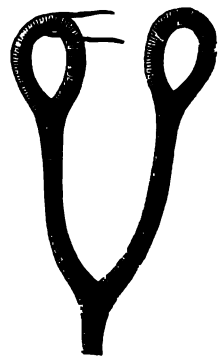
All the standing rigging is *parcelled* and *served* over wherever it is liable to be chafed, where wet is likely to lodge, or where any of the strands have been opened for splicing (Figs. 88, 89, 89 *b*).

The parcelling would not lie smooth on a large rope, unless the hollows between the strands were first filled up with *worming* (Figs. 87, 89).

FITTINGS OF THE STANDING RIGGING.

93

94



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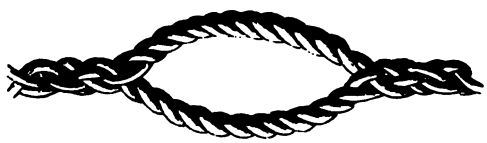

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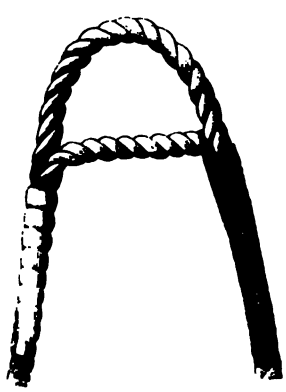

98

FITTINGS OF BLOCK STROPS.

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100

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102

103

104

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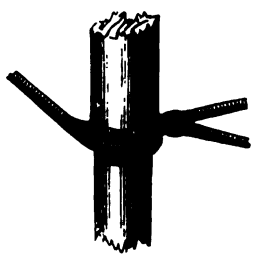

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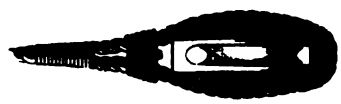


EXAMPLE :—

All the large shrouds are wormed, parcelled, and served, where they touch the masthead, to preserve them from the wet; and one-third of the way down each leg, to protect it from the chafe of the other ropes, and from the yards when braced sharp up.

FITTINGS OF BLOCK STROPS.

A single strop (Figs. 99, 100) is a ring of rope or chain.

A double strop (Figs. 105, 106) is a long single strop doubled.

A single strop is the one generally used.

A double strop, or two single strops, are used with large blocks when a block is required to lie differently, or when greater strength is required.

IF FITTED ROUND A SPAR.

How must a block be stropped if the rope is required to be led in a line with or along the spar?

With a single strop (Figs. 99, 100); or, if a large rope, two single strops (Figs. 109, 110).

How must a block be stropped if the rope is required to be led at right angles to the spar?

With a double strop (Figs. 105, 106).

IF LASHED ON A SPAR.

How must a block be stropped if the rope is required to be led in a line with or along the spar?

With a single strop (Figs. 101, 102); or, if a large rope, with a double strop (Figs. 103, 104).

How must a block be stropped if the rope is required to be led at right angles to the spar?

With two single strops (Figs. 107, 108).

PLACING THE STANDING RIGGING.

The rigging forming the largest angle with the spar is put on first, and that forming the smallest angle last, thus assisting to keep the other rigging in its place.

The wood-cut represents the rigging of the dolphin striker, the lowest rope evidently keeping the upper one from slipping off (Fig. 112).

The only exceptions to this rule are the lower, topmast, and jib stays; these being lashed at the masthead, are placed on top of the other rigging.

If lashings were placed below rigging, they would be cut in the rolling of the ship, as they cannot be protected with serving, parcelling, &c.

EXAMPLES OF FITTED RIGGING.

Rigging fitted with an eye-splice (Fig. 93).

Eyes of royal, top-gallant, and flying-jib stays (Figs. 113, 114).
Eyes of all single shrouds and backstays (Figs. 115, 117).
Both ends of the jib-guys and martingale (Figs. 168, 169).
Flying jib-guys and martingale (Fig. 167).
Topping lift for spritsail gaff (Fig. 170).
All single braces and lifts (Fig. 130).
All jackstays, stirrups, and flemish horses (Figs. 133, 135, 136).
Foot ropes on all yards (Figs. 133, 135, 136).
Yard tackle pendants (Figs. 134, 136).
All single strops with lashing eyes (Figs. 101, 102).

Rigging fitted with a fork and two lashing eyes (Fig. 94).

All lower and topmast stays, and the jib-stay (Figs. 115, 117).

Rigging fitted with a throat seizing on the bight (Fig. 96).

All double shrouds and backstays (Figs. 113, 114, 115, 117).
Fore and main mast-head pendants (Fig. 117).

Rigging fitted with a cut splice (Fig. 95).

Burton pendants; mizen mast-head pendants (Fig. 116).
Jib and flying-jib foot ropes (Figs. 167, 168).

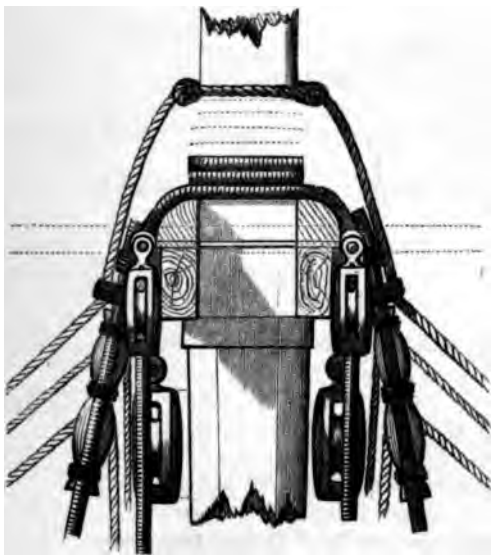
Rigging fitted with a half crown (Fig. 98).

Jib sheet, and stay-sail pendants (Figs. 222, 233).
Back ropes (Fig. 169).

Rigging fitted with a horse shoe splice (Fig. 97).

The jumper and after jib-guy (Fig. 170).

116



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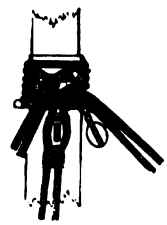

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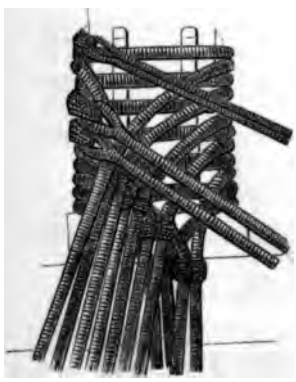

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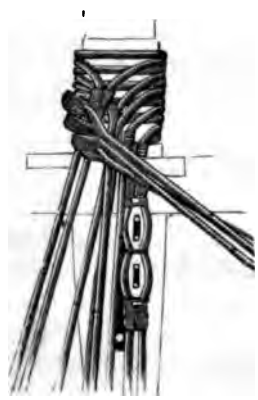


Parts of rigging where a single strop is used (Figs. 99, 100, 101, 102).

All head earing strops (Figs. 130, 136).
All lift blocks (Figs. 134, 136).
All dog strops for braces (Fig. 136).
Royal and top-gallant parrels (Figs. 138, 139).
Chain truss strops (Fig. 135).
Quarter blocks on royal, top-gallant, and topsail yards (Figs. 131, 133).
All rolling tackle, and quarter strops; clewgarnet blocks (Figs. 131, 134, 135).
Bobstay, and bowsprit shroud collars (Figs. 161, 163).
Bobstays (Fig. 161).
Fore stay collars (if fitted bale sling fashion) (Fig. 164).

Parts of rigging where a double strop is used (Figs. 103, 104, 105, 106).

The jeer blocks at the lower mast-heads.
All lower brace blocks (Fig. 148).
Quarter blocks on lower yards (Fig. 135).
Fore stay collars (if not fitted bale sling fashion) (Fig. 166).
Lower fish block (Fig. 288).

Parts of rigging where two single strops are used (Figs. 107, 108, 109, 110).

Jeer blocks on lower yards (Fig. 135).
Topsail brace blocks (Fig. 147).
Upper fish block (Fig. 283).

RIGGING OF MASTS.

The rigging of a royal mast, top-gallant mast and topmast, is placed upon a copper funnel fitting the mast head; this keeps the rigging together in its place when the masts are sent down, and likewise prevents the rigging cutting into the mast head.

How is a royal funnel or mast rigged?

With a stay leading forward, and backstays on each side (Fig. 113).

How is a top-gallant funnel rigged?

With a stay leading forward, and shrouds and backstays on each side (Fig. 114).

How are the royal, top-gallant, and flying-jib stays, fitted?

With an eye spliced round the funnels on the royal and top-gallant mast-heads.

How are the royal backstays, and the top-gallant shrouds and backstays fitted?

Each pair, with a throat-seizing on the bight round the funnels on the royal and top-gallant mast-heads (Figs. 113, 114).

What extra rigging is there on the fore top-gallant masthead?

The flying jib-stay. It is fitted with an eye splice, and is placed immediately above the top-gallant stay, underneath the shrouds and backstays (Fig. 114).

How, and where, is the top-gallant rigging secured?

The two shrouds, after leading down through the horns of the topmast crosstrees, and the rollers on the spider hoop on the topmast head (Figs. 119, 120), are spliced together, and the double block of a purchase fitted in the bight: the lower block is secured to the eye of one of the lower shrouds (Fig. 120). This ensures both the top-gallant shrouds being always taut alike, or after leading through the horns of the crosstrees they are led across, and are secured on the opposite side of the top, without using a spider hoop.

Where is the fore royal stay secured?

It is rove over a dumb sheave in the flying-jib boom end, through the dolphin striker below the rigging, and set up to one of the knight heads.

Where are the main and mizen royal stays secured?

They are rove through a sheave in the topmast crosstrees amidships, and set up in the top to the eye of the upper lower shroud (Fig. 126).

Where are the jib and flying-jib stays secured?

They are rove through a sheave in the end of their booms, through the dolphin striker, and set up with a purchase to the knight heads, one on each side.

Where is the fore top-gallant stay secured?

It is rove over a dumb sheave in the jib-boom end, through the dolphin striker below the rigging, and set up to one of the knight heads.

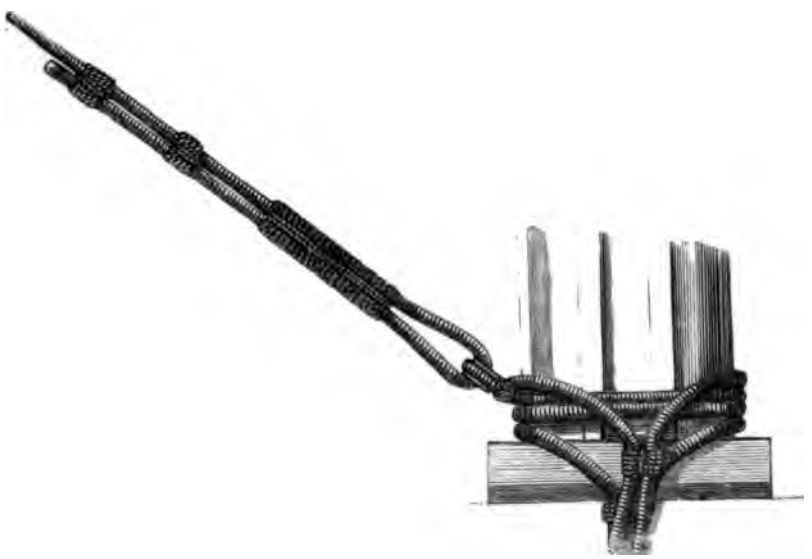
Where are the main and mizen top-gallant stays secured?

They are led forward, rove through a hole in the lower cap,

SECURING TOP-GALLANT RIGGING AND MIZEN TOPMAST.

119

118



and set up in the top to the eye of the upper lower shroud (Fig. 126).

(When staysails are to be set, the main top-gallant stay is taken to the fore topmast crosstrees, and the royal stay to a strop at the fore top-gallant mast-head.)

How is a topmast funnel rigged?

With a burton pendant, shrouds and backstays on each side, and two stays leading forward (Fig. 115). A chain necklace is placed on the fore and main topmast under all the rigging and the bolsters for the hanging blocks to shackle to (Fig. 116). The mizen topmast having only one topsail tye, has no hanging blocks or necklace, the tye being rove through a sheave in the mast.

What is the use of the necklace on the topmast head, and how is it fitted?

It goes round the mast-head immediately on top of the trestle-trees and crosstrees, being fixed down to the latter with iron staples. The hanging blocks used in hoisting the topsail, jib, and fore-topmast staysail, and sometimes for the jib stay, are iron stropped and shackled to chain or iron legs, which hang down from the necklace on each side of the masthead (Fig. 116).

How are the burton pendants fitted?

With a cut splice, leaving one leg hanging down on each side of the topmast (Fig. 95). They are used for setting up the topmast rigging, &c.

What difference is there in the fittings of the first and second pair of topmast shrouds?

The foremost pair has a sister block seized in between them for the topsail lift and reef tackle (Fig. 116).

In rigging a mast, which is the odd shroud?

The after one.

Which is the odd backstay?

The foremost one, as it sets up well forward by itself for a breast backstay, the other two being close together aft.

What extra rigging is there on the fore-topmast?

The jib stay. The two legs of the fork are rove from forward down through the fork of the topmast stays, and are lashed together abaft the masthead under them (Fig. 115). It would be placed above the topmast stays, and led straight to the jib-boom if there were room for it

between them and the under part of the foremost cross-tree.

What extra rigging is there on the mizen topmast?

A short pendant with a thimble spliced into the end, hangs down on each side of the masthead, for the standing part of the main topsail brace to reeve through, as it passes up from the mizen-chains. They are fitted with a cut-splice, and are placed on the masthead before the burton pendants.

(A chain necklace and hanging blocks are sometimes used.)

How, and where, is the topmast rigging secured?

With dead eyes and lanyards to the futtock shrouds, which, after reeving through the top, are secured alternately to the two necklaces round the lower mast (Figs. 120, 121).

What is the use of having two necklaces?

If one carries away, only half of the rigging on each side is gone.

Where are the fore-topmast stays secured?

They are rove through the bees of the bowsprit, through the spritsail gaffs, and set up to the knight heads with lanyards.

Where are the main-topmast stays secured?

They are rove through iron-bound clump blocks, shackled to hoops on the head of the foremast (Fig. 128), and set up abaft the foremast with lanyards, to bolts in the deck.

Where is the mizen-topmast stay secured?

A strop with a thimble seized in it is placed on the main masthead, under the eyes of the lower rigging. The stay is set up with a lanyard to the thimble, or it is rove through the thimble, and secured with a racking seizing to its own part (Fig. 118).

How are the lower masts rigged?

With masthead pendants and shrouds on each side, two stays leading forward, and a jeer-block strop (Fig. 117).

NOTE.—Except the mizenmast which has only one stay, and no jeer block strop.

How are the masthead pendants fitted?

With a throat-seizing on the bight round the lower masthead, leaving a long and a short leg hanging down on each side of the lower mast, the long leg being aft and the short one forward. The mizenmast has only one

pendant on each side, which is fitted with a cut-splice round the mast-head.

(A chain necklace round the mast-head under the bolster, with the pendants shackled to it, is sometimes used.)

What are the masthead pendants used for?

The two long legs lashed together abaft the mast, are sometimes used for staying the mast (Fig. 96); the short legs for setting up the lower rigging, fishing the anchor, &c.; they are fitted short enough to admit of being dipped round the futtock shrouds.

How are the burton pendants fitted?

With a cut splice, leaving one leg hanging down on each side of the topmast (Fig. 95). They are used for setting up the topmast rigging, &c.

How is each pair of shrouds fitted?

With a throat-seizing on the bight round the mast-head.

How is the after-swifter or a single shroud fitted?

With an eye spliced round the mast-head.

How, and in what order, are the shrouds placed on the topmast or lower mast-heads?

The foremost pair on the starboard side is placed first, then the foremost pair on the port side, then the second pair on the starboard side, second pair port side, and so on, working aft (Fig. 117). The seizing of the first pair of shrouds on each side, is placed as far forward on the trestletree as possible, the seizing of the second pair overlaps half of the seizing of the first pair, that of the third pair overlaps half of the second pair, and so on. With wire rigging, there will be room for the shrouds, if the seizings are laid clear of each other.

(It is a common practice to place the after-swifters first, in order to steady the mast at once, and get it into its place whilst placing the other rigging, but it is of no use afterwards, and has its disadvantages; it raises the foremost shrouds, and therefore prevents the lower yard being braced up as sharp as by the old method.)

How are the jib, topmast, and lower stays fitted at the mast-heads?

With a fork and two lashing-eyes, which are lashed together abaft the mast-head, with a rose lashing (Figs. 115, 117).

If the topmast and lower stays were not fitted separately, but with throat-seizings on the bight, if one stay were carried away the strain of the mast would be on the seizing. If shot or carried away above the seizing, both

stays would be gone. The seizing would likewise have to be put on aloft after the stays were placed.

The jib-stay is frequently rove through a hanging block, shackled to the chain necklace at the fore-topmast head, and the end secured with a chain slip at the jib-boom end. It is set up with a purchase abaft the foremast.

What is the use of the jeer block at the lower mast-head, and how is it fitted?

It is used in sending the lower yard up or down, and is fitted with a long double strop. The two parts are rove up through a hole in the top before the foremost cross-tree, and lashed together abaft the mast-head with a rose lashing.

Why are the stays on the lower and topmast heads placed on top of the rest of the rigging?

By placing the stays on top of the rest of the rigging, it takes up less room on the mast-head, and allows the yard to brace up sharper.

NOTE.—For the same reason the mizen stay is sometimes taken over the foremost crosstree.

What extra rigging is there on the main-mast?

A strop with a thimble seized in, for the mizen topmast-stay to secure to, is placed under the shrouds (Fig. 118).

How, and where, is the lower rigging secured?

With dead eyes and lanyards to the chain plates, which are bolted to the ship's side (Figs. 120, 121). Notches are cut in the outside edge of the channel, to receive the chain plates, which are confined in their places by the guard board (Figs. 7, 8).

How is a dead eye turned in, or secured to a shroud?

The shroud is taken down the fore side, and round the dead eye; the end then nips round the standing part of the shroud, passing from out, in towards the ship—throat, quarter and end seizings are put on the two parts: this leaves the seizings aft, and the ends inside in the shrouds on both sides of the ship (Figs. 122, 123).

(A racking seizing, Fig. 124, has lately been used for turning in a dead eye. It is evidently the proper seizing for the purpose, and *must* be used for wire rigging.)

Where is the standing part of the lanyard of a shroud secured?

For the lower rigging it is spliced into a bolt in the chains, abaft and inside of the dead eye (Fig. 122). For the

SECURING THE LOWER SHROUDS AND STAYS.

122

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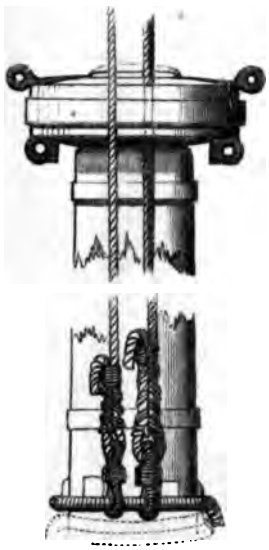
SECURING UPPER STAYS AND BREAST BACKSTAYS.

126



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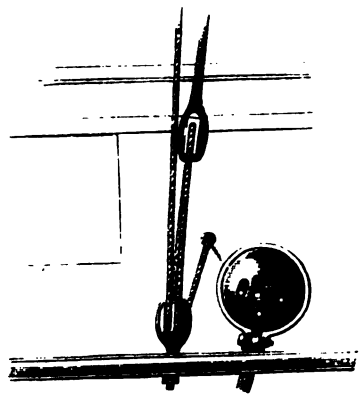

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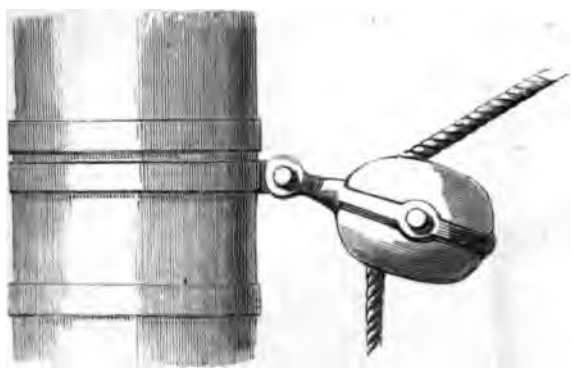

RIGGING OF A TOP-GALLANT YARD.

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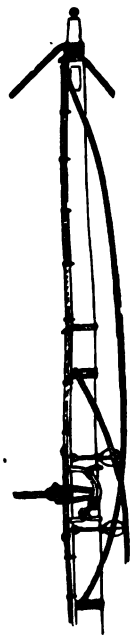

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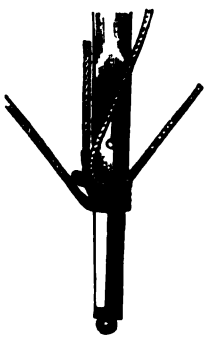

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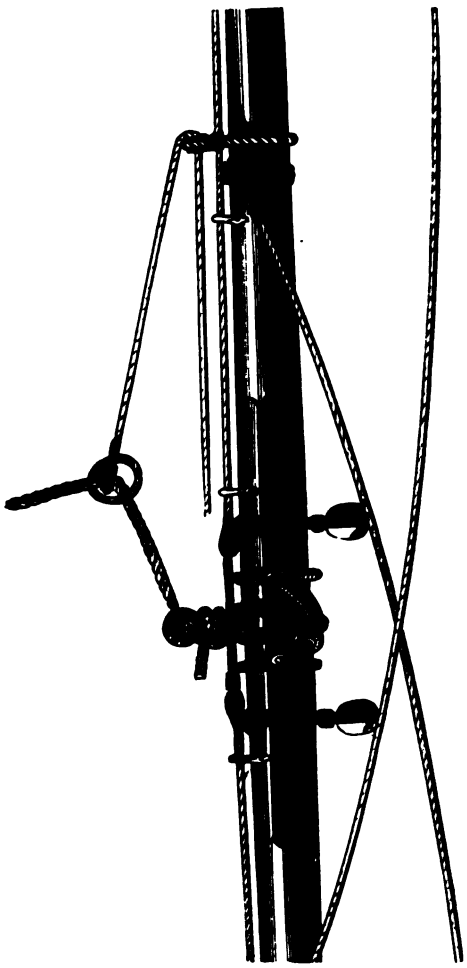

topmast rigging, a Matthew Walker knot is made in the standing part, and the lanyard then rove from in, out, through the after hole of the upper dead eye (Fig. 199).

Why is the standing part of the lanyard rove first through the after hole of the dead eye?

On hauling taut the lanyard, the part nearest the purchase will evidently take the strain first, this part must therefore be forward immediately under the shroud, or the dead eye would be turned round (Fig. 122).

After setting up the rigging, how is the end of the lanyard secured?

It is rove out over the top of the upper dead eye, taken forward round the shroud below the nip, then aft inside of everything, and round below the throat seizing, in again over the top of the dead eye and its own part, forming a clove hitch and the end seized down (Fig. 123), or two round turns are taken round the shroud below the nip, and the end seized down (Fig. 124).

How are the hearts turned in or secured to the fore and main stays?

The same as turning a dead eye into a shroud (Figs. 159, 165); thus the starboard stay is the same as a starboard shroud, and the port stay the same as a port shroud. The starboard stay is placed above the port one on the mast head.

Where are the fore stays set up?

To collars on the bowsprit (Fig. 159), or in a very long ship, to the knight heads.

Where are the main stays set up?

To the knight heads, or to a crosspiece before the fore bitts.

How are the lanyards of the fore and main stays rove and secured?

Four turns are passed, and the lanyard is then set up on both ends, the ends are expended in riding turns, and all parts are kept in their places by good spunyarn seizings (Fig. 125).

RIGGING OF THE YARDS.

Every yard must have at the yard arms—

A Footrope—for the men to stand upon.

A Head earing strop } for bending the sail to.
A Jackstay }
A Brace, for altering the position of the yard when necessary.
And a Lift—for supporting the yard arm.

At the slings or bunt—

Slings—Tie blocks or halliards—to support or hoist it.
Trusses or a Parrel—to keep it close into the mast.
And quarter blocks—for the clewlines, and the sheets of the sail set above it to reeve through.

How is the bunt of a royal or top-gallant yard rigged?

With slings, a parrel, and quarter blocks (Fig. 131). (The halliards are sometimes bent to the yards with a studding-sail bend; in which case the slings are not fitted.)

How is the bunt of a topsail yard rigged?

With tie blocks, a parrel, quarter blocks, and a pendant used in sending the yard up or down on deck (Fig. 133).

How is the bunt of a lower yard rigged?

With chain slings in the centre, and a jeer block, a quarter block, two truss strops, and a clew-garnet block on each side (Fig. 135).

How is a royal or top-gallant yard arm rigged?

With a footrope, head earing strop, jackstay, brace and lift (Fig. 130).

(Sometimes a royal yard has no head earing strop, in which case the earing is secured round the yard arm.)

How is a topsail yard arm rigged?

With a footrope, head earing strop, jackstay, dog strop for the brace block, and a lift block. A flemish horse is spliced round the goose neck (Fig. 132). Topsail yards are frequently fitted without flemish horses, the footropes being secured round the goose neck; a stirrup is then placed on the yard arm in the place of the footrope. This fitting is more convenient for the yard-arm men, but brings a greater strain on the goose neck. A turk's head should be fitted on the footrope outside of the outer stirrup, to prevent it unreaving in case the goose neck should carry away.

How is a fore yard arm rigged?

With a footrope, head earing strop, jackstay, yard-tackle pendant, dog strop for the brace block, a lift block and the standing part of the lift (Fig. 136).

How is a main yard arm rigged!

With a footrope, head earing strop, jackstay, yard-tackle

RIGGING OF A TOP-SAIL YARD.

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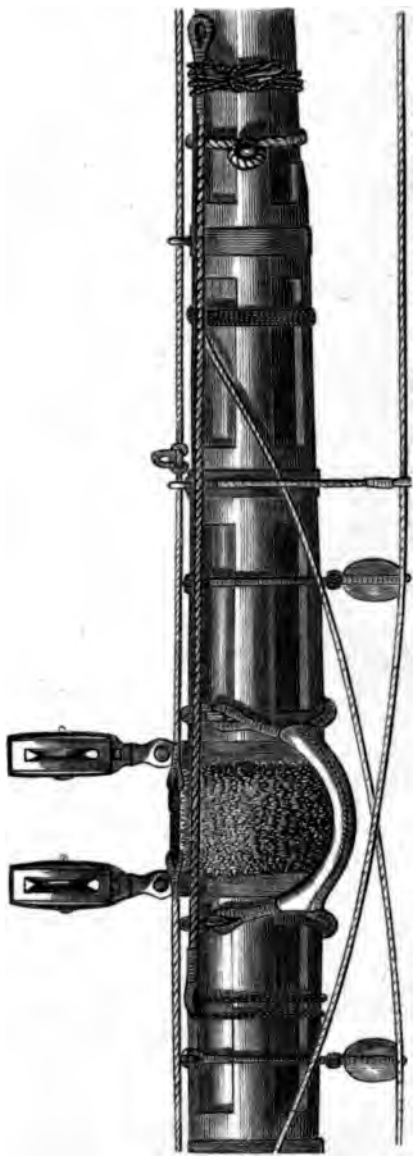
133



BUNT OF A LOWER YARD.

pendant, dog strops for the preventer brace block and after brace block, a lift block, and the standing part of the lift.

How is a cross-jack yard rigged?

In the bunt with slings, truss strops and quarter blocks. At the yard arms with a footrope, brace block and lift. (Jackstays are sometimes fitted).

How are the slings of the yards fitted?

Each royal and top-gallant yard has a strop rove on the bight round the bunt of the yard. The foremost bight is passed up through the after one and a thimble seized into it; or the after bight is lashed to the foremost parts taut round the yard. The halliards are bent to the slings with a double bend, or bent round the yard with a studding-sail halliard bend.

The lower yards have chain slings fitted in the same way, a shackle or large link being used instead of a lashing (Fig. 135). The upper part of the slings is supported by a chock on the after side of the lower masthead, and is fitted with a swivel and slip (Figs. 153, 121).

How are the tie blocks on a topsail yard fitted?

They are each iron-bound with a swivel, and shackled to bands round the yard, the swivel prevents the tie being injured against the edge of the block when the yard is braced up (Fig. 133).

How are the jeer blocks on a lower yard fitted?

They are two single blocks placed one on each side of the slings, and are each fitted with two single strops one longer than the other, which are lashed together on the fore-side of the yard with a rose lashing. For the long strop take once and a half the round of the yard and once round the block; for the short once the round of the block and ½ round the yard (Figs. 135, 137).

(If lashed on the after side, the lashings would be chafed between the mast and the yard.)

How is the parrel fitted on a royal or top-gallant yard?

Two strops, one on each quarter of the yard. One is fitted taut round the yard with a thimble seized in, the other having two seizings is left long enough to pass round abaft the mast and lash to the short one (Figs. 131, 138, 139).

How is the parrel fitted on a topsail yard?

Two pieces of rope of unequal length, seized one on top of

the other; they are puddinged, marled together, and covered with leather, leaving a long and a short leg at each end with spliced eyes in them: the centre goes abaft the mast: the long leg on each side goes under the yard, and lashes on top to the short one (Figs. 133, 140, 141). For the long leg take two-thirds the round of the mast and twice the round of the yard. For the short, two-thirds the round of mast, and allow for splicing in each.

How are truss strops fitted?

Four chain strops with the ends lashed together on top of the yard with a rose lashing: a shackle is fitted to each on the after side of the yard. The two strops which are used for the starboard truss are lashed, so that the shackles on the after side of the yard may lie a little higher than those for the port truss (Figs. 135, 142, 143).

In placing the truss strops on the yard, the ones for the truss pendants to shackle to are placed inside on one quarter of the yard and outside on the other: this keeps both hawling parts clear.

NOTE.—On the crossjack yard, there is only one strop each side.

How are the truss pendants rove?

Forward through a block shackled to a bolt on the after horn of the trestle-tree, down through a large shackle in the truss strop on the quarter of the yard, led round abaft the mast and shackled to the truss strop on the opposite quarter.

The cross-jack truss is rove with the bight abaft the mast, the ends passed up through the shackle of truss strop, one on each side and a block shackled to each end.

How are the quarter blocks on a royal yard fitted?

Two single blocks each fitted with a single strop and two lashing eyes, which are lashed together on top of the yard with a rose lashing (Fig. 131).

How are the quarter blocks on a top-gallant yard fitted?

Two double blocks, each fitted with a single strop and two lashing eyes, which are lashed together on top of the yard with a rose lashing (Fig. 131).

(A chain strop is sometimes lashed on each quarter of the yard, leaving a link hanging down under the yard, or a bolt is driven through the yard for the quarter block to hook to. This is very convenient, as the blocks being unhooked are not knocked to pieces as the yards are sent up or down.)

RIGGING OF A LOWER YARD—PARRELS.

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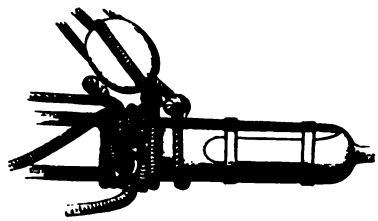

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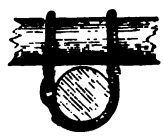

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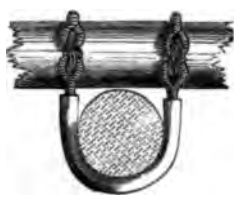

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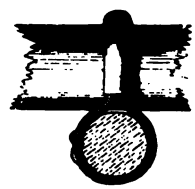

FITTINGS OF YARDS.

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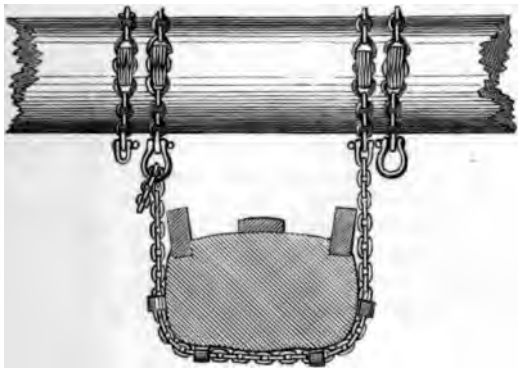

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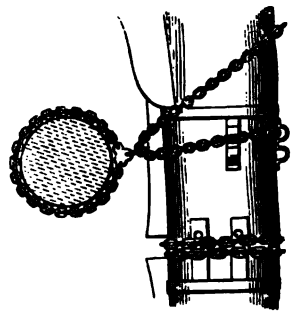

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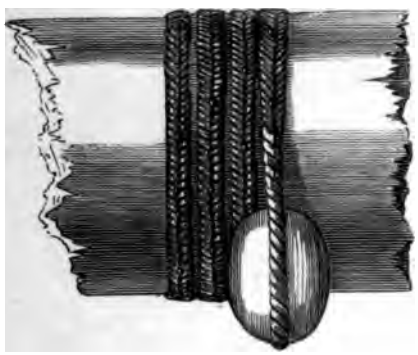

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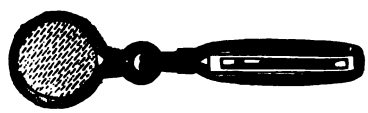

How are the quarter blocks on a topsail yard fitted?

Two double blocks, each fitted with a single strop, leaving two legs with lashing eyes, which are lashed together on top of the yard with a rose lashing (Fig. 133); or, two single blocks on each quarter, one for the top-gallant sheet, and the other for the topsail clewline, fitted in the same way. A becket with two sennet tails secured on the yard, and the quarter block fitted to toggle to it takes the clew higher, and is convenient for shifting topsail yards (Fig. 144): or a strop lashed taut on the yard with a thimble worked in on the fore side, in the same way as working a cringle into the bolt rope of a sail.

How are the quarter blocks on a lower yard fitted?

Two single blocks, each with a double strop leaving two long bights which are lashed together on top of the yard with a rose lashing. The two blocks are lashed together under the yard to prevent them being hauled out towards the yard arms (Figs. 135—145).

How are the clew-garnets blocks on a lower yard fitted?

Two single blocks, each with a single strop, leaving two legs with lashing eyes, which are lashed together on top of the yard with a rose lashing; or a single sennet tail taken three times round the yard and nailed: this takes the clew of the sail much higher (Figs. 135, 146).

Why are the quarter blocks outside the parrel on a royal, top-gallant and topsail yard?

To allow them to hang clear of the cap when the yards are lowered.

How are footropes fitted?

With an eye splice round the yard arm, the inner ends being lashed to the yard on the opposite quarter with a rose seizing (Figs. 129, 132). On the lower yard the two inner ends lash together and trice up to the slings of the yard (Fig. 134, 135).

(The footropes on a topsail and lower yard are frequently fitted with an eye splice round the goose necks.)

How are stirrups fitted?

They are short legs hanging down from the yard on the after side to support the footropes, and are fitted with an eye splice at each end—one round the jackstay bolt under the jackstay, and the other round the footrope (Fig. 133, 135).

When the footrope is secured round the goose neck, the outer stirrup is spliced round the yard arm inside the rigging, taking the place of the footrope.

How is a head earing strop fitted?

A grummet strop is fitted round the yard arm with a thimble seized taut in on top of the yard, for the head earing of the sail to secure to (Fig. 130, 136).

How is a jackstay fitted?

With an eye splice round the yard arm, passed through the jackstay bolts or strips of leather nailed on the yard, the inner ends being lashed together in the slings (Figs. 135, 136).

When braces and lifts are single, how are they fitted?

With an eye splice round the yard arm (Fig. 130).

Top-gallant, and royal lifts and braces, are frequently spliced into an iron ring which goes over the yard arm (Fig. 152); this is very convenient, as they never alter in size when wet, as the rope does.

When top-gallant braces are double, how are the brace blocks on the yard arm fitted?

With a single strop round the yard and the block, with a round seizing between them.

How is a topsail brace block fitted?

The strop round the yard is called the dog strop, and is a single strop; the block is fitted with two single strops which are connected with the dog strop by two thimbles working one in the other; this leaves the sheave of the block lying perpendicularly (Fig. 147).

How is a lower brace block fitted?

The dog strop is a single strop round the yard, with a thimble seized in, the block is fitted with a double strop and a thimble, and is connected with the dog strop by the two thimbles working one in the other; the sheave of the block lying horizontal (Fig. 148).

How is the preventer main brace block fitted?

The same as the other lower brace blocks. It is placed inside the after main brace, which keeps it from being dragged off the yard arm when the yard is braced up (Fig. 148).

Why are brace blocks fitted with dog strops?

In bracing a yard round, the brace acts in so many different

FITTINGS OF YARDS.

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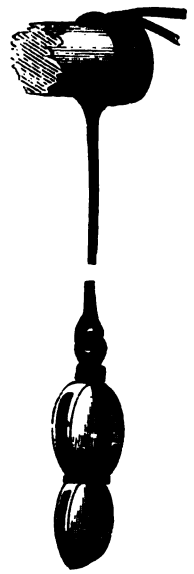

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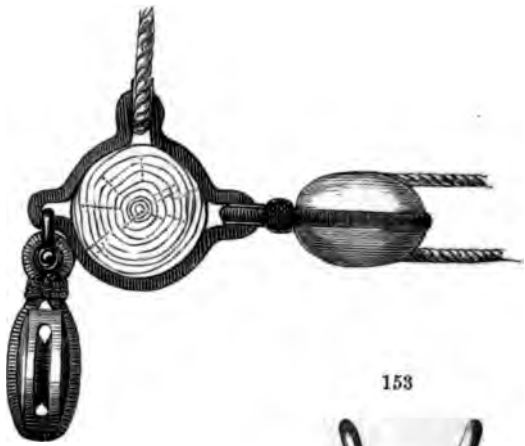

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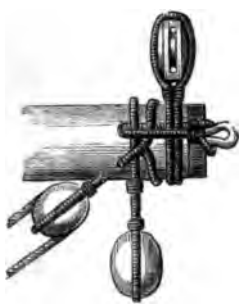


directions, that there would not be play enough in the block strop if fitted taut to the yard.

When lifts are double, how is the block fitted?

With a single strop round the block and the yard, with a round seizing between them (Fig. 149).

How is the standing part of a lower lift secured?

With a running eye or an outside clinch round the yard arm outside the lift block (Fig. 136).

How is a yard-tackle pendant fitted?

With an eye splice round the yard arm, and the other end spliced through the strop of the fiddle block; or round the fiddle block which is seized taut in (Fig. 150).

How are quarter strops fitted?

A grummet strop with a thimble seized taut in; on the royal and top-gallant yards they are used for stopping the yard ropes out to in sending the yards down (Fig. 131).

On the topsail and lower yards they are used for hooking a rolling tackle to in bad weather to steady the yards (Fig. 133).

How is the pendant for shifting the topsail yard fitted?

Each end has an eye splice. One end is lashed to the quarter of the yard, or rove round the yard with a running eye; the other end is secured with a lizard to the opposite quarter (Fig. 133).

STUDDING-SAIL BOOMS.

How is a top-gallant and main-topmast studding-sail boom rigged?

With a tack block fitted with a single strop, and toggled over the eye bolt in the outer end of the boom (Fig. 229).

How is a fore-topmast studding-sail boom rigged?

With a lower halliard block; boom brace and a tack block, each being kept from slipping in by a snotter, which is toggled over the eye bolt in the end of the boom (Fig. 151).

How is the lower halliard block fitted?

With a long strop round the block and the boom, with two seizings between them (Fig. 151), or a dog strop is fitted round the boom end and the lower halliard block stropped into it.

How is the boom brace fitted?

With a whip and pendant; the pendant being spliced round the boom end (Fig. 151).

How is the fore-topmast studding-sail tack block fitted?

With a double strop round the boom and the block (Fig. 151), or a dog strop is fitted round the boom end and the tack block, which has a single strop stropped into it.

An iron band on the boom end with studs for the rigging is a snug way of fitting studding-sail booms.

BOWSPRIT.

How is a bowsprit secured?

By gammonings, bobstays, and shrouds.

Which gammoning is put on first—and why?

The outer one, having more leverage on the bowsprit than the inner one, must be put on first; otherwise, it would slack the inner one on its being hauled taut (Fig. 154).

How are the turns of a gammoning passed—and why?

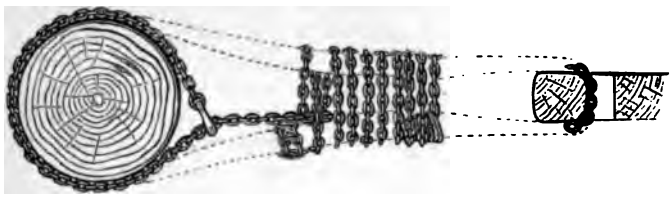
The standing part is shackled round the bowsprit with a running eye, the end passed down, through the foremost part of the hole in the cutwater, up round the bowsprit outside of the standing part, and boused taut with a purchase (Fig. 155); whilst the next turn is being passed the first is stoppered by driving large nails (which are not taken out again) through the links of the chain into the gammoning fish on top of the bowsprit, and by racking it to the first part.

In passing the second turn, the end is passed down inside the first turn crossing it from forwards aft, led through the hole in the cutwater abaft the first turn, up towards the bowsprit being dipped inside the first part crossing it from aft forwards, then taken over the bowsprit outside the first turn, the purchase is then put on, boused taut, racked and nailed as before. The rest of the turns are passed the same as the second, forward on the bowsprit and aft through the cutwater, being each boused taut separately (Fig. 157).

The last turn coming down from the bowsprit is secured with a strand to the others close down to the cutwater, the end is then frapped round all parts up towards the

GAMMONING OF THE BOWSPRIT.

158



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155

bowsprit, the last turn forming a figure of eight, and the end secured with good spunyarn (Fig. 158).

In consequence of the turns of the gammoning crossing each other they close together on being hauled taut.

If the last turns of the gammoning were crossed outside the first turns, the gammoning would be equally as strong, but it would not form so snug a lashing.

How is each turn of the gammoning housed taut?

A pendant, deck tackle, and capstan are used.

The pendant having two selvagee tails, is secured to the bight of the gammoning, close to the bowsprit (Fig. 156). The tackle is secured to the other end of the pendant, and the fall taken to the capstan.

In hauling taut assist the chain by hammering it, being careful to have no turns in the chain.

If the ship is not alongside a wharf, where the purchases may be worked, the pendant is led through a block secured to one of the bobstay holes in the stem and then inboard through the hawse hole. Whilst one turn is being hauled taut, the next may be passed ready. A single whip is used to overhaul the purchase for the next turn.

How is a bowsprit clothed?

Inner fore stay collar, inner bobstay collar, first pair of bowsprit shroud collars.

Outer fore-stay collar, middle bobstay collar, second pair of bowsprit shroud collars.

Outer bobstay collar: and the cap bobstay immediately under the fore-topmast stays (Fig. 159).

The inner fore-stay collar is placed two-thirds out, measuring from the knight heads to the outside part of the bowsprit cap; and the three bobstay collars are the diameter of the bowsprit apart.

If the forestay collars are fitted bale sling fashion?

Inner bobstay collar, first pair of shroud collars, inner fore-stay collar.

Middle bobstay collar, second pair of shroud collars, outer fore-stay collar.

Outer bobstay collar, and cap bobstay (Fig. 160).

How is a bobstay collar fitted?

A single strop with the heart seized into the centre leaving two equal legs which are fitted with lashing eyes and are lashed together on top of the bowsprit with a

rose lashing, the heart being under the bowsprit (Figs. 161, 162).

With a chain collar an iron ring is used instead of a seizing to keep the heart in its place.

The measurement for a rope collar is, once round the bowsprit, heart, and rope, and allow for splicing.

How is a bowsprit-shroud collar fitted?

A single strop with the heart seized in one-third from the end, leaving one leg twice as long as the other; they are fitted with lashing eyes and are lashed together on top of the bowsprit with a rose lashing, the heart being at the side of the bowsprit, and the longest leg underneath (Fig. 163). Measure the same as for bobstay collar.

With a wire collar a grummet is used instead of a seizing to keep the heart in its place.

How is a forestay collar fitted?

A warped or wire strop is fitted, and the heart placed in one bight with a temporary spunyarn seizing to keep it in its place, the opposite bight of the strop is taken round under the bowsprit, brought up and lashed to the collar below the heart, or a grummet is worked round the collar under the heart and the opposite bight is lashed to the grummet with a rose lashing. The heart is left at the side of the bowsprit, and has a large wooden chock to prevent its working round on to the top. Once round bowsprit and heart will give the drift between the warping pins (Figs. 164, 159).

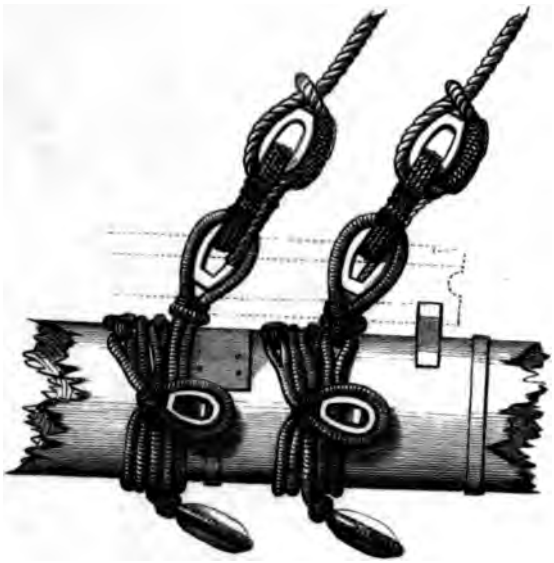
If fitted with a double strop.

The heart is seized into the bight of a long double strop with a flat seizing on each side of the heart, and the eyes of the strop lashed together under the bowsprit with a rose lashing. The jib-boom passes through the collar between the heart and the bowsprit. The measurement for this is, twice round the bowsprit and heart (Figs. 165, 166).

The first plan is the neatest; but the double strop would save the bowsprit cap in the event of the crupper chain being carried or shot away; it gives more room for working the jib-boom, and divides the strain better amongst the bobstays.

BOWSPRIT RIGGING.

159



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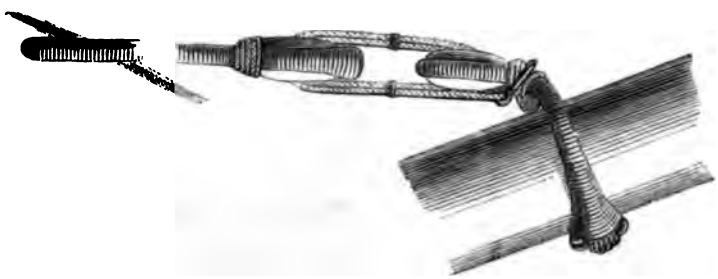
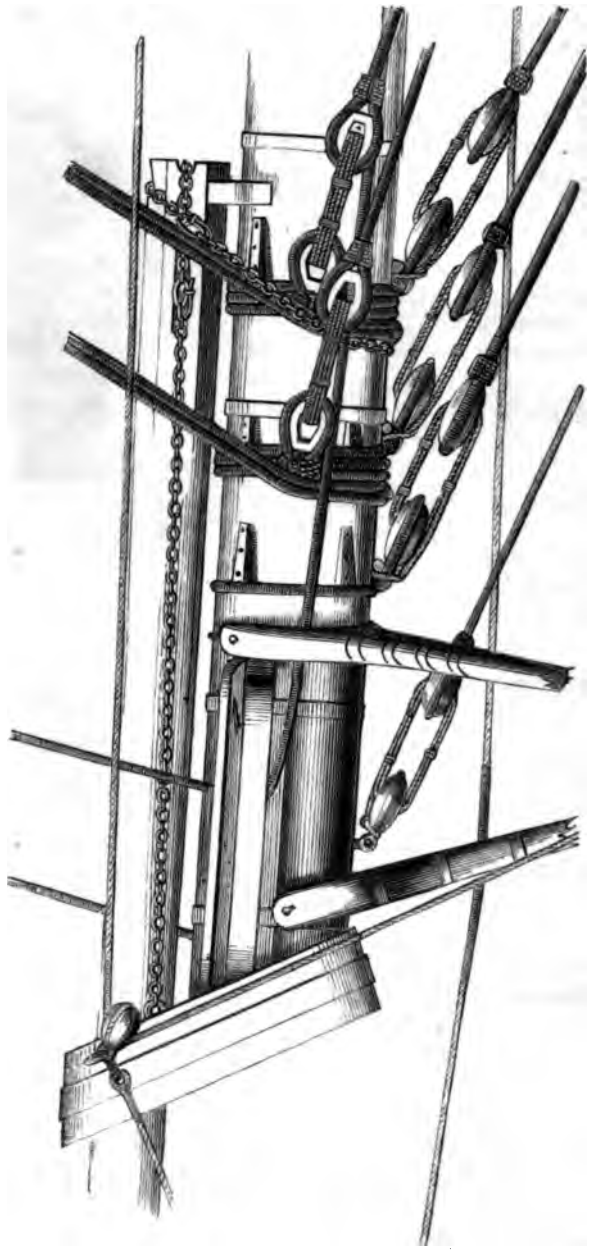


BOWSPRIT RIGGING.

160



How is a bobstay fitted?

The rope is rove through a hole in the stem, the ends are then spliced together round a heart which is seized taut in to the upper bight (Figs. 161, 162, 154).

How is a bowsprit shroud fitted?

Single, either of chain or wire rope, a heart is spliced into the upper or outer end, and a chain slip into the after end. The slip is secured to a bolt in the bow, and enables the bowsprit shroud to be let go quickly, when the bow guns are fired (Figs. 154, 163).

How is each bobstay and bowsprit shroud secured to its collar?

By a lanyard; the standing part is rove with a running eye round the collar above the heart, three turns are taken through the two hearts, and the end expended in riding turns (Figs. 160, 161).

NOTE.—A bolster is placed between the seizing of each bobstay collar and the bowsprit.

How is a forestay secured to its collar?

By a lanyard, which being rove with four turns must be set up on both ends (Fig. 125).

It is of no use pulling up on one end of a lanyard if more than three turns are passed, as the opposite end would then bear no strain whatever, the turns not rendering.

How and where are the jaws of the dolphin striker secured?

With a jaw rope rove over the bowsprit immediately inside the cap (Fig. 154).

How and where are the jaws of the spritsail gaffs secured?

With a jaw rope rove over the bowsprit immediately outside the rigging (Fig. 154).

How is a jib-boom secured in its place?

With a heel chain to keep it out, and a crupper chain to keep the inner end close down in the saddle (Fig. 160).

How is the heel chain fitted?

In two pieces, shackled to the bowsprit cap on different sides, one being longer than the other. The long piece passes round the heel of the jib-boom and is secured to the short piece with a chain slip (Fig. 160).

How is the crupper chain fitted?

It is a chain strop round the bowsprit and the heel of the jib-boom, the two ends being secured together with a chain slip on the side of the bowsprit)Fig. 160).

How is the flying jib-boom secured in its place?

The boom rests in a boom-iron fitted on the end of the jib-boom. The inner end rests in a notch cut in the bowsprit cap and is secured with a heel lashing passed round the jib-boom close to the cap and a belly lashing passed half-way along the jib-boom (Fig. 154).

How are the jib and flying jib-booms rigged?

With footropes, guys and a martingale (Figs. 167, 168).

NOTE.—Funnels and a jackstay are very convenient for jib-booms.

How are the footropes fitted?

With a cut splice, being stopped out on each side to the guys, the after ends of the jib-boom footropes are lashed to bolts in the cap, and those of the flying boom are secured to the jib guys (Figs. 167, 168, 154).

How are the jib guys fitted?

With an eye splice in each end to fit the funnel of the jib-boom and the end of the spritsail gaff (Figs. 168, 170).

The jib guy and after guy are sometimes fitted in one with a half crown round the spritsail gaff end. The jumper guy is then fitted separate with an eye splice.

How are the flying-jib guys fitted?

With an eye splice round the end of the boom, rove through a hole in the end of the spritsail gaff outside the rigging, and set up to the bows close to the knee of the cathead (Figs. 167, 154).

How is the jib martingale fitted?

With an eye splice in each end, one to fit the funnel of the jib-boom and the other the end of the dolphin striker (Figs. 168, 170).

How is the flying-jib martingale fitted?

With an eye splice round the boom, rove through a hole in the end of the dolphin striker and set up in the head (Figs. 167, 169).

How is a dolphin striker rigged?

With two back ropes and the jib martingale (Fig. 169).

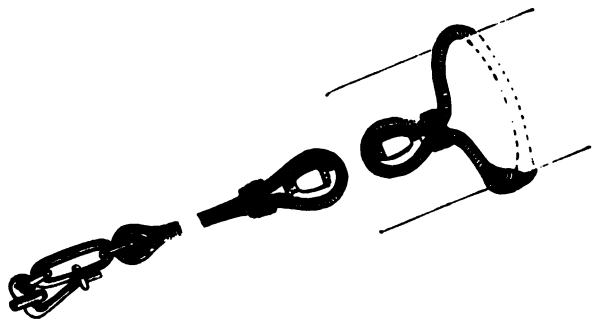
How are the back ropes fitted?

With a half crown seized round the dolphin striker and the after ends set up with lanyards to bolts in the bow close to the knee of the cathead (Figs. 169, 154).

An iron band with studs for the martingale and back ropes to be fitted to is frequently used on the dolphin striker.

BOWSPRIT RIGGING.

163



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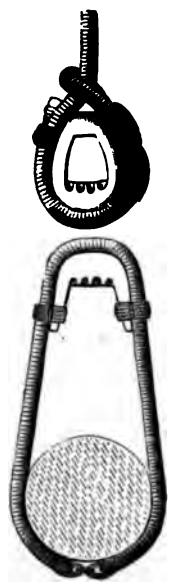

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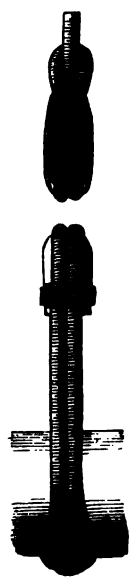

BOWSPRIT RIGGING.

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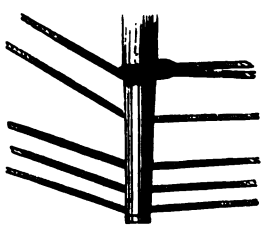

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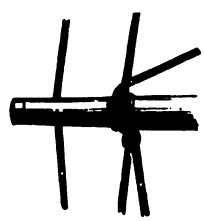


How are the spritsail gaffs rigged?

After guy and jumper, jib guy, and topping lift; sometimes the topping lift is put on first to steady the gaffs while the rigging is being placed (Fig. 170).

How are the jumper and after guy fitted?

With a horse-shoe splice round the end of the gaff (Fig. 170).

The after guy is set up with a lanyard to a bolt in the bow close to the knee of the cathead (Fig. 154).

The jumper is rove through a clump block on the cutwater, and is set up with a purchase in the head (Fig. 154).

How is the spritsail gaff topping-lift fitted?

With an eye-splice round the gaff end, rove through a block on the bowsprit cap and set up with a purchase to the knight heads (Fig. 160).

What stays reeve through the bees of the bowsprit?

The fore-topmast stays (Fig. 160).

What stays reeve through the jib-boom?

The jib-stay; the foretop-gallant stay reeves over the end of the boom outside all the rigging (Fig. 154).

What stays reeve through the flying-jib boom?

The flying-jib stay; the fore-royal stay reeves over the end of the boom outside everything (Fig. 154).

What stays reeve through the jaws of the spritsail gaffs?

The fore-topmast stays after reeving through the bees of the bowsprit (Fig. 160).

What stays reeve through the dolphin striker?

The jib stay, fore top-gallant stay, flying-jib stay, flying-jib martingale and fore-royal stay (Fig. 154).

FITTINGS OF BLOCKS.

A block is measured by its length, and should be three times the size of the rope which is rove through it.

The Shell.—The outside wooden part, made of elm or metal (Fig. 171).

Sheave.—A wheel travelling inside the shell, made of lignum vitæ or metal (Fig. 171).

Bouching.—A strengthening part in the centre of the sheave, made of metal (Fig. 171).

Pin.—An iron bolt through the shell and the sheave, for the latter to travel upon (Fig. 171).

Swallow.—The part through which the rope reeves (Fig. 171B).

Strop.—A ring of rope, iron, or chain, encircling a block, for securing it to its place.

Score.—A groove cut in the side and bottom of a block, to enable the strop to lie closer, and to prevent its slipping off (Fig. 171).

Clump-block.—A short thick block.

Shoulder-block.—A block having a projection in the shell to prevent the rope being jammed between the block and the spar to which it is secured (Fig. 205).

Snatch-block.—An iron-bound block with the shell cut away immediately over the swallow, to allow any part of the rope to be lifted in and out of the block, without putting its end through first. The iron strop over the swallow is fitted with a hinge, which should be clamped and pinned before being used (Fig. 174).

(Snatch-blocks should not be used for heavy gear, such as a heel rope, mast rope, &c.

Fiddle-block.—A long block with one sheave above and larger than the other; it is used instead of a double block to lie closer to a yard or boom (Figs. 150 and 172).

Ninepin-blocks.—A number of blocks secured horizontally between the bitts at the foot of each lower mast for leading the different ropes along the deck.

Quarter-block.—A single or double block secured on the quarter of each yard, to reeve the sheet and clewline (Figs. 133, 135).

Sister-blocks.—Two single blocks formed out of one piece of wood, one above the other; they are secured between the two foremost shrouds of the topmast rigging, for the reef-tackle and topsail lifts to reeve through (Figs. 116 and 173).

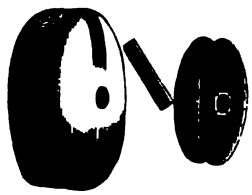
Jeer-blocks.—Large blocks on the fore and main yards, and on the foremast and mainmast heads, for raising the lower yards (Fig. 135).

NOTE.—The crossjack yard is sent up and down with two burtons.

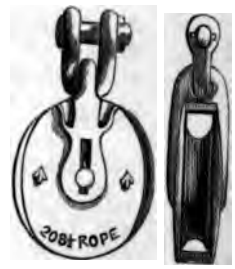
Hanging-blocks.—Are iron-bound and shackled to a chain or iron necklace round the fore and main topmast heads under the

BLOCKS.

171



171 *B*



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173 B

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175

bolster, for the topsail tyes, and jib and stay sail halliards to reeve through (Fig. 116).

Top-blocks.—Large single iron-bound blocks, hooked to the after bolt in the lower cap for the top tackle pendant to reeve through, when sending topmasts up or down (Figs. 236, 239).

Span-blocks.—At the topmast and top-gallant mastheads for studding-sail halliards to reeve through (Figs. 226, 227).

Jewel-blocks.—At the topsail and top-gallant yard arms for the studding-sail halliards to reeve through (Figs. 152 and 228).

FITTINGS OF TACKLES.

When a block is secured in any way to a weight, and a rope led through it, it forms a purchase.

The amount of purchase gained always equals the number of parts of the rope in the movable block, the stationary block only serves as a lead for the rope.

When one tackle is put upon another, multiply the two powers together for the total amount of purchase gained.

In consequence of friction the hauling part of a purchase has most strain in pulling up, the standing part in easing away.

The greater the amount of purchase used, the steadier will be the strain.

Dead Eyes, Hearts, and Thimbles.—Are fitted in the ends of all the large rigging in order to secure each with a lanyard; they are not to be counted upon as purchases, on account of the great friction (Figs. 121, 122, 125).

With a lanyard rove three times, if an inch is lost in securing, only one-sixth of an inch is lost in the shroud itself.

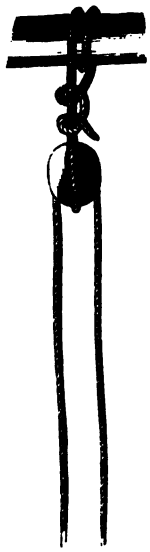
In setting up any rigging, if more than three turns of the lanyard are taken, the standing part will have little or no strain, therefore if it is required to take four or more turns, the lanyard must be set up upon both ends (Fig. 196).

	Power gained.	*Fittings.*
Single whip (Fig. 176).	None.	A single rope rove through a fixed single block fitted with a tail.

	Power gained.	*Fittings.*
Runner (Fig. 177).	Twice.	A single rope rove through a movable single block.
Double whip (Fig. 178).	Twice.	Two single blocks, upper one fitted with a tail, the lower a movable block with a hook.
Tail jigger (Fig. 179).	3 or 4 times, depending on which is the movable block.	The double block is fitted with a tail, single block with a hook.
Luff (Fig. 180).	3 or 4 times, do.	A double and a single block, each fitted with a hook.
Top burton (Fig. 181). and 181 B.	3 times.	The double block is fitted with a hook; the single one with a long strop hook and thimble, and another long strop or tongue with a thimble, is spliced round strop of single block.
Up-and-down (Fig. 182).	3 times.	The double block fitted with a lashing—single block with a hook.
Runner and tackle (Fig. 183).	8 times.	The runner is rove through a single block fitted with a lashing, and spliced round the double block of the tackle, the single block of which is fitted with a hook.
Sail tackle (Fig. 184).	Twice.	Two single blocks—the strop of the upper one is fitted with two tails of unequal length, the short one is fitted with a hook, and the other with a thimble; the lower block is fitted with a hook, and a fair leading block stropped to it.

TACKLES.

176



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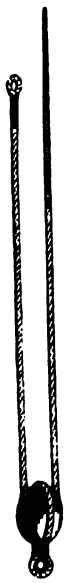

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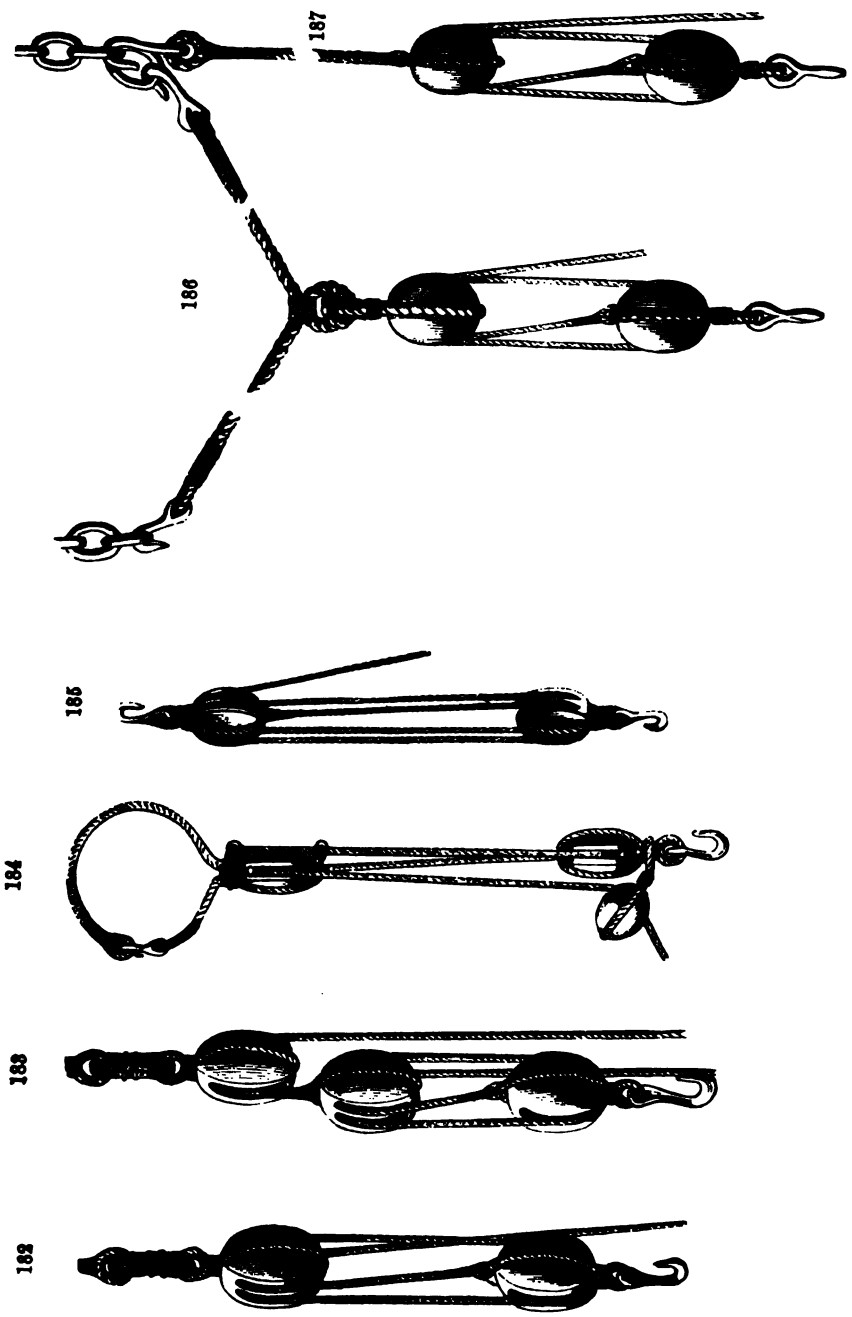
181 B

TACKLES.



	Power gained.	*Fittings.*
Gun tackle purchase (Fig. 185).	4 or 5 times.	Two double blocks, each fitted with a hook.
Yard tackles (Fig. 134).	3 times	The yard tackle pendant is spliced into the strop of the upper which is a fiddle block. The lower block is a single block with a hook.

NOTE.—The yard tackles are kept on the fore and main yards, triced up by the quarter tricing line which is secured to the fiddle block, and the bill tricing line which is secured to the bill of the hook of the lower block, and trices it up to the lower rigging under the futtocks.

If yard tackle pendants were fitted with a single block and the hauling part led up through a cheek on the fore side of the yard arm, through a block at the cap, and down on deck, considerable strain would be taken off the yard.

	Power gained.	*Fittings.*
Forestay tackle (Fig. 186).	3 times.	The upper block, which is double, is fitted with a span to enable the tackle to hang clear of the funnel; the lower block is single and fitted with a hook.
Mainstay tackle (Fig. 187).	3 times.	The upper block, which is double, is fitted with a pendant and hook: the lower block is single and fitted with a hook.

A strop and thimble is fitted into the strop of the lower block of the stay tackles for the yard tackles to hook to.

NOTE.—In hoisting boats in or out—the foremost leg of the span of the forestay tackle (which should be marked) is hooked to a chain hanging below the fore-top from a hoop round the mast-head. The other leg of the span and the pendant of the mainstay tackle are hooked to the spare links in the slings of the main yard.

	Power gained.	*Fittings.*
Quarter tackle (Fig. 188).	Twice.	Two large single blocks, each fitted with a long pendant and hook.
Lower lift purchase (Fig. 189).	3 times.	A double block stropped to a bolt in the deck, and a single block stropped to the lower lift.

	Power gained.	*Fittings.*
Top-gallant halliard purchase (Fig. 190).	3 times.	A single block secured to a bolt in the deck, and the upper single block fitted with a long strop and toggle, toggled to the top-gallant yard rope. A top-gallant halliard purchase may be put on or taken off quicker than a lower lift purchase. A lower lift purchase is neater but takes longer to reeve.
Spanish burton (Fig. 191).	3 times.	Two single blocks, one stationary, one movable.

Swinging off—That is pulling at right angles to a taut rope. The power gained is at first very great, but it decreases gradually the moment the rope is out of the straight line until it forms an angle of 120°, when there is no power gained. Therefore the longest and the tautest rope gives the greatest purchase.

What is the strongest fitting for the standing part of all tackles?

It is led through a becket in the lower part of the block, and spliced round both parts of the strop (Fig. 184).

The size of a block strop depends upon the number of parts of the fall rove through the block; in a single block it need only be the size of the fall; with a double block having four parts of the fall, the strop must be increased in size accordingly.

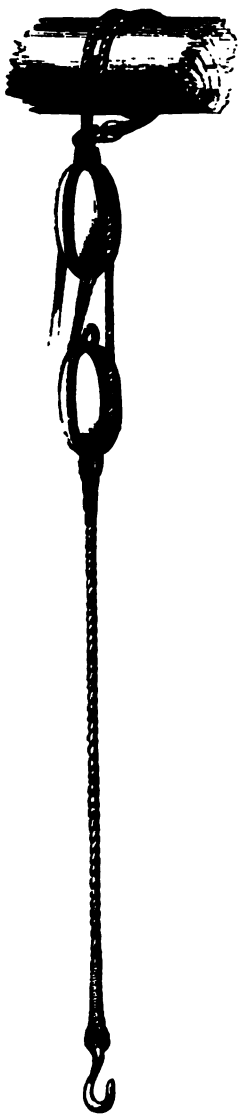
SETTING UP RIGGING.

What tackles are used for staying lower masts, and how?

Two runners and tackles—the runner blocks are lashed to the long legs of the mast-head pendants, which are lashed together abaft the mast (Fig. 192), (or to strops round the mast, the upper one close below the necklace, and the lowest about one-third down from the trestletree to the deck) (Figs. 193, 194, 195), the end of the runner, and single block of the tackle, are secured to bollard

QUARTER TACKLE—SPANISH BURTON.

188



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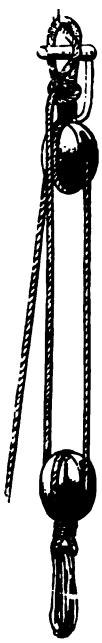

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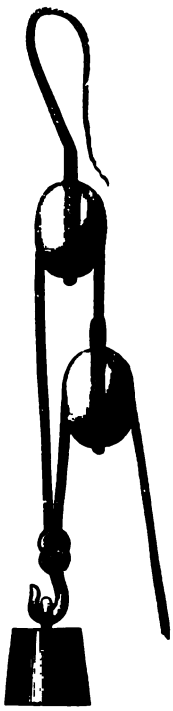

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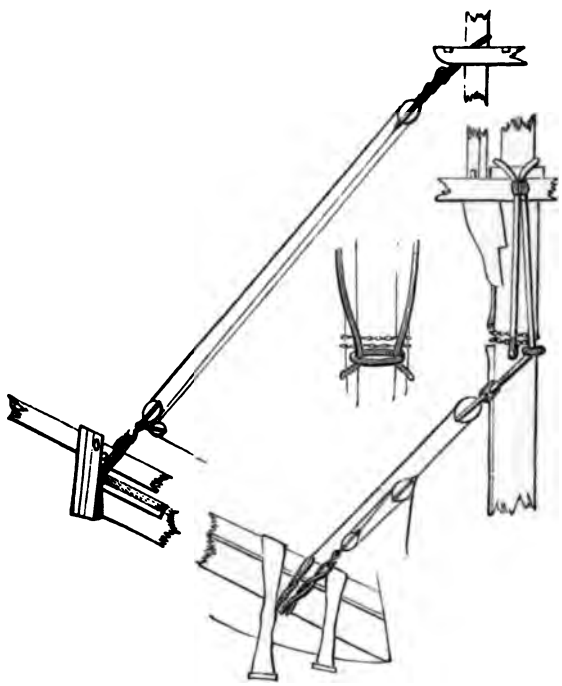
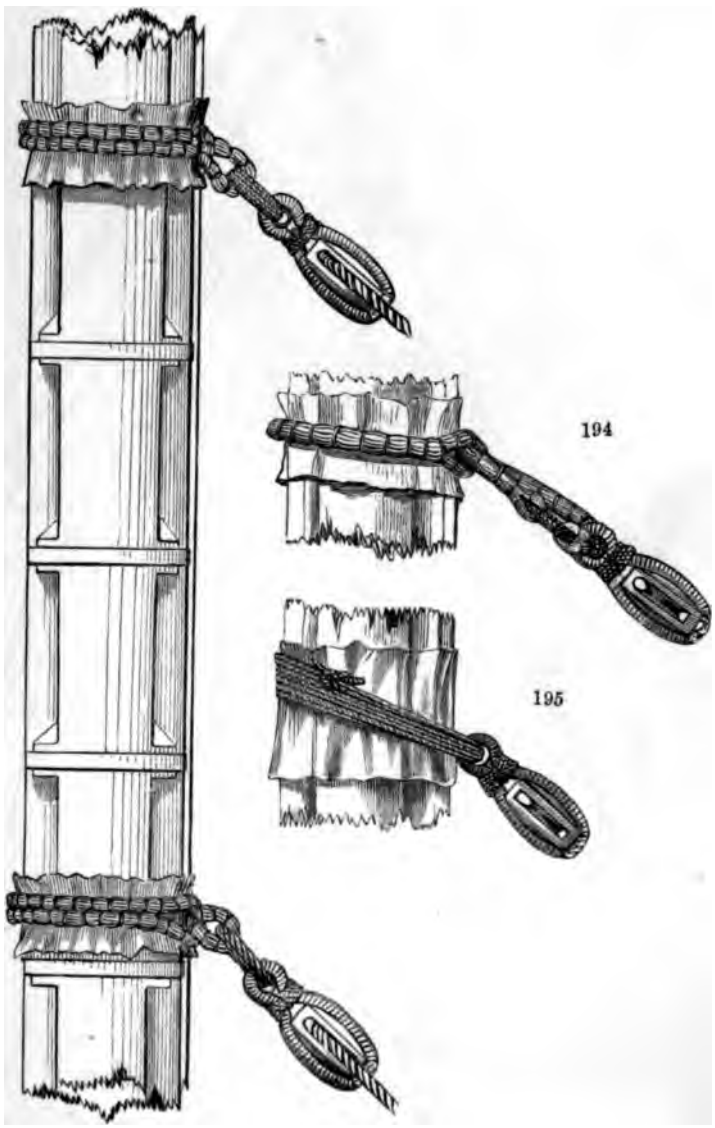


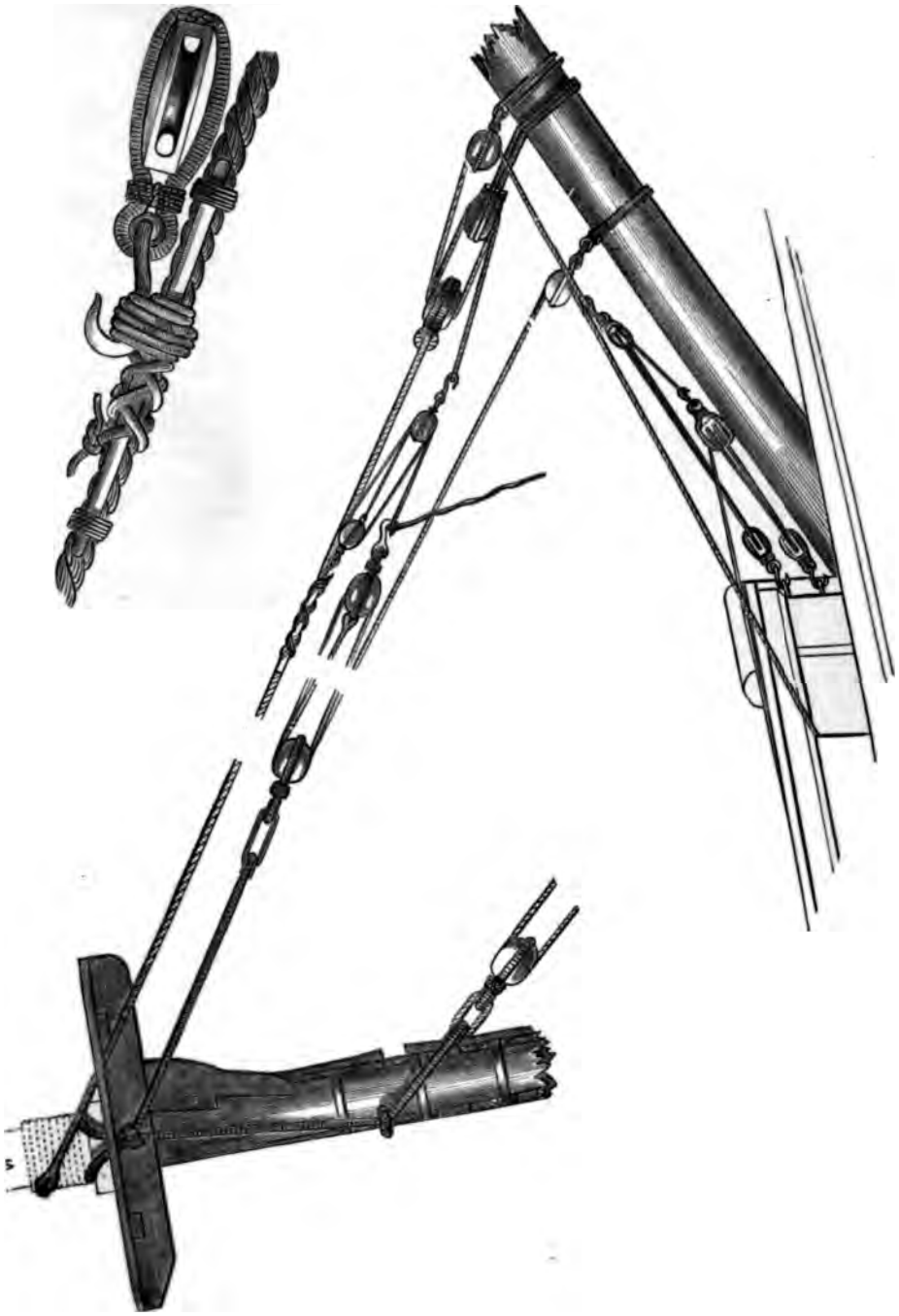
LASHING RUNNER BLOCKS.

193



SETTING UP A LOWER STAY.

197 196



heads, or round the bowsprit (Fig. 192). The tackle is generally hooked to the bight of the runner.

What is the use of lashing the pendants together abaft the mast?

It brings the strain lower down the mast, and therefore does not bow it as it would otherwise do (Fig. 192).

What is the advantage of using strops round the lower mast for the runners to secure to, instead of lashing them to the pendants?

It brings the strain quite in the centre of the mast. In using strops well down, care must be taken that the shrouds are slack, otherwise it would buckle the mast.

The stays must in all cases be secured before the shrouds are set up.

How are the strops for the runner blocks put on?

In taking them round the mast, the after bight is put through the foremost one—this prevents the strop being nipped in any part (Fig. 193).

The runner blocks are frequently lashed to the mast with a round-about lashing (Fig. 195).

How is a fore or main stay set up?

The lanyard is set up upon both ends—the end leading up from the heart on the bowsprit is set up with a luff, and an up-and-down (Fig. 196).

The double block of the luff is hooked to the lanyard, the single block lashed to the stay (Fig. 197). The double block of the up and down tackle is lashed to the short leg of the mast-head pendant, which is dipped over the lower yard, and the single block hooked to the fall of the luff.

The other end of the lanyard leading down from the upper heart is rove through a leading block on the bowsprit and then set up with a luff upon luff.

In setting up lower stays, why do you pull upon both ends of the lanyard?

It enables more turns of the lanyard to be rove before pulling up, and ensures a more equal strain on all parts. If you pull upon only one end, the lanyard would not render, and consequently the fourth turn would be of no use (Fig. 196).

What tackles are used in setting up lower rigging, and how?

A luff and an up-and-down—the double block of the luff is hooked to the lanyard (Fig. 198 B.); the single block to a strop on the shroud. The double block of the up-and-down is lashed to the short leg of the mast-head pendant

and the single block hooked to the fall of the luff (Fig. 198).

How is the lower rigging set up?

The purchases having been got up, the shrouds and all the gear abaft the masts are slacked up, the after-swifters being kept moderately taut. The runners and tackles are then pulled up, the mast got forward into its place, and the stays properly secured; then, keeping the runners on the mast, set up the rigging, commencing with the foremast shroud.

What tackle is used for staying topmasts, and how?

A sail tackle—hooked round the topmast-head, and taken down to the deck forward. The fore sail-tackle is hooked to a strop round the bowsprit (Fig. 192). The stay is then set up with a luff on each turn of the lanyard.

What tackles are used for setting up the topmast rigging, and how?

A runner and top-burton—the runner block is secured to the lanyard; one end of the runner is secured to the shroud, and the other hooked to the single block of the top-burton, the double block of which is hooked to the burton pendant at the topmast head (Fig. 199).

What tackles are used for setting up topmast backstays, and how?

The same as for the topmast shrouds, only the double block of the burton is hooked to a strop on the backstay abreast the top.

What tackle is used for setting up top-gallant and royal backstays?

A tail jigger put on the backstay and hooked to the lanyard.

In setting up lower rigging, how is the luff hooked to the lanyard?

A round turn is taken with the lanyard round a toggle, and the end left hanging down; then a round turn with a strop round both parts of the lanyard; and the luff is hooked to the two parts of the strop (Fig. 198 B).

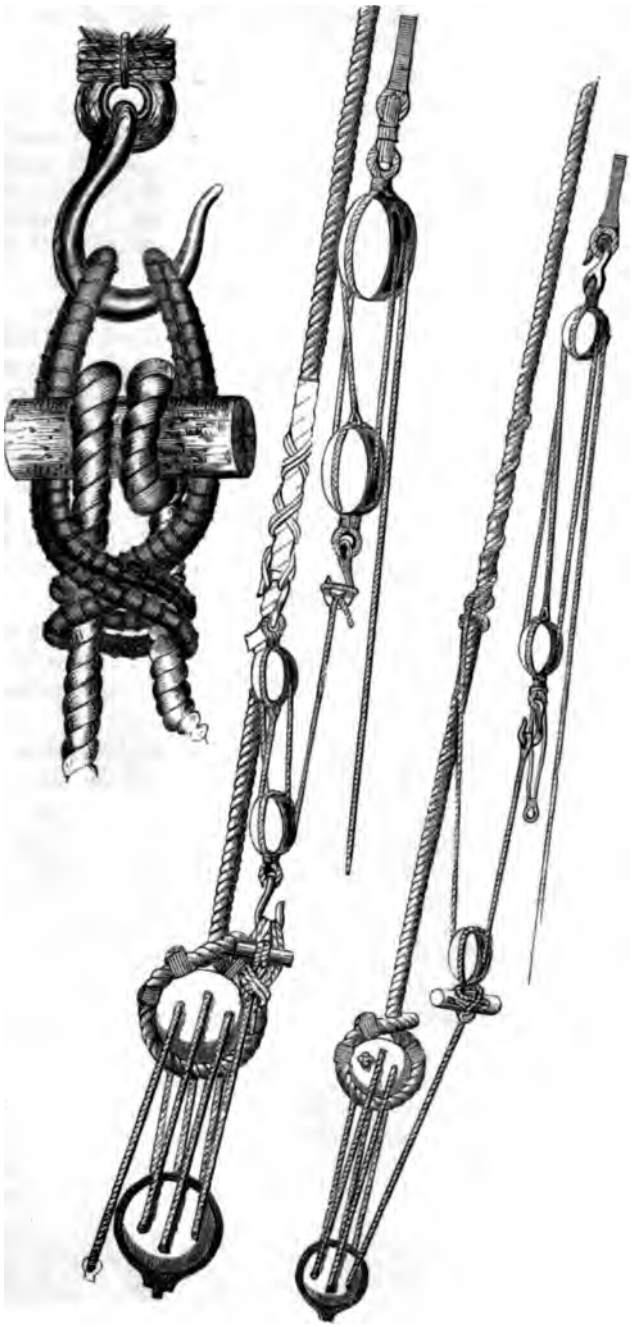
How is the up and down tackle hooked to the luff?

With a double Blackwall hitch, or a marlingspike hitch (Figs. 25, 26).

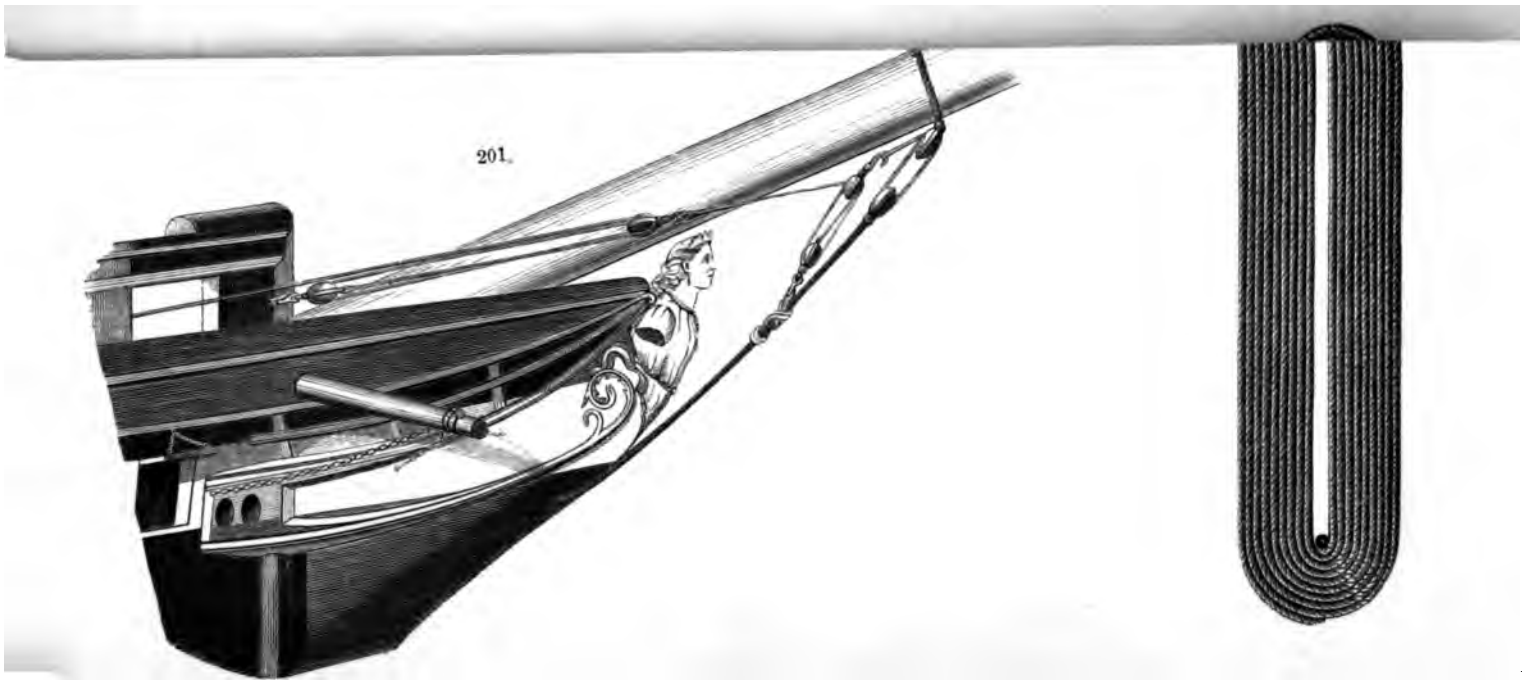
In setting up topmast rigging, how is the lanyard secured to the runner block?

The bight of the lanyard is rove through the thimble in the strop of the runner block, and a single bend made round the strop, putting a toggle in to keep it from jamming (Fig. 199).

198B. 198 199



SETTING UP A BOBSTAY—RACKING—CUTTING OUT RIGGING.



In setting up the lower rigging, how can you tell when the mast is upright?

By measuring with a batten, one end against a mark in the deck (placed by dockyard), and the other touching a marked hoop on the mast. Lower masts have also a straight line marked up and down on one side—by securing a piece of white-line taut to bolts at the top and bottom of the line, the slightest belly in the mast may be detected.

How are bobstays set up?

With a luff upon luff. The double block of a luff is hooked to a strop on the bobstay, and the single block hooked to the lanyard: the fall is led through a leading block on the bowsprit, in on to the forecastle, and the other luff put on it (Fig. 200).

Fig. 201 will answer for some ships.

QUESTIONS ON RIGGING.

What gear is on a lower mast before it is stepped?

Two mast-head gantlines with the blocks secured to the mast-head above the trestletrees—and a pair of bellropes clove-hitched on the bight round the mast-head above the upper hoop, for the men to steady themselves with, while working aloft (Figs. 231, 232).

NOTE.—The top tackle falls are used as gantlines.

How are the lower masts steadied before the rigging is placed?

The runners and tackles are lashed to selvagee strops round the mast: the upper one just below the necklace, and the lowest one-third from the trestletrees to the deck; the ends of the runners and the lower blocks of the tackle are secured to bollard heads, or round the bowsprit, and the mast got forward into its place at once (Figs. 193, 194, 195).

In placing the rigging how are the shrouds sent aloft?

The two gantlines are secured to the after horns of the trestletrees, one on each side—and a mast-head gantline is lashed to the afterpart of the mast-head as high as possible.

The shrouds are sent aloft in pairs—stop the two shrouds together below the seizing, leaving a long enough drift

above the stop for the eye to clear the mast-head—toggle or secure the gantline, stopping it at the seizing, and to the centre of the eye. The toggle should be secured to the gantline, leaving sufficient end to reach the deck when the shroud is over the mast-head, so that the toggle may be hauled down by it, for next shroud—"*sway away*" (Fig. 202). When the eye reaches the block, cut the upper stop and sway a little higher—bend or toggle the mast-head gantline close below the seizing, stopping it if requisite to the centre of the eye—sway away—cut the stops, and the shroud is placed by the men aloft—unreeve the mast-head gantline from between the mast-head and the eye of the shroud.

Or send the shrouds over with a single mast-head gantline on each side of the mast-head—the hauling part being led down on the after side of the mast between two of the mast-head battens will enable it to be unrove when all the shrouds are placed.

NOTE.—If the topmast is pointed and hung by the two up and down tackles, the gantlines may be secured to the topmast-head.

In placing the rigging how is it made to lie as close as possible on the mast-head?

When the pendants are sent aloft, the up and down tackles are lashed to the short legs; and as each pair of shrouds is placed, reeve the lanyards, and set them up with the up-and-down, beating down the eye of the shroud with a commander.

(If the dead eyes are not turned in, put a tackle on each pair of shrouds and set them up to a bolt in the deck.)

Before fitting hemp rigging, how much is it stretched?

One inch for every foot.

How far is the foremost shroud served down, and why?

All the way, as it catches the chafe of the sail.

How far are all the rest of the shrouds served down, and why?

One-third, as the yard touches and chafes them when it is braced up.

In placing the rigging, how are the shrouds known from each other?

They are all marked with knotted spunyarn; the pair going over first with one knot, the second with two knots, and so on. This brings all the odd-numbered knots the starboard, and the even-numbered the port side.

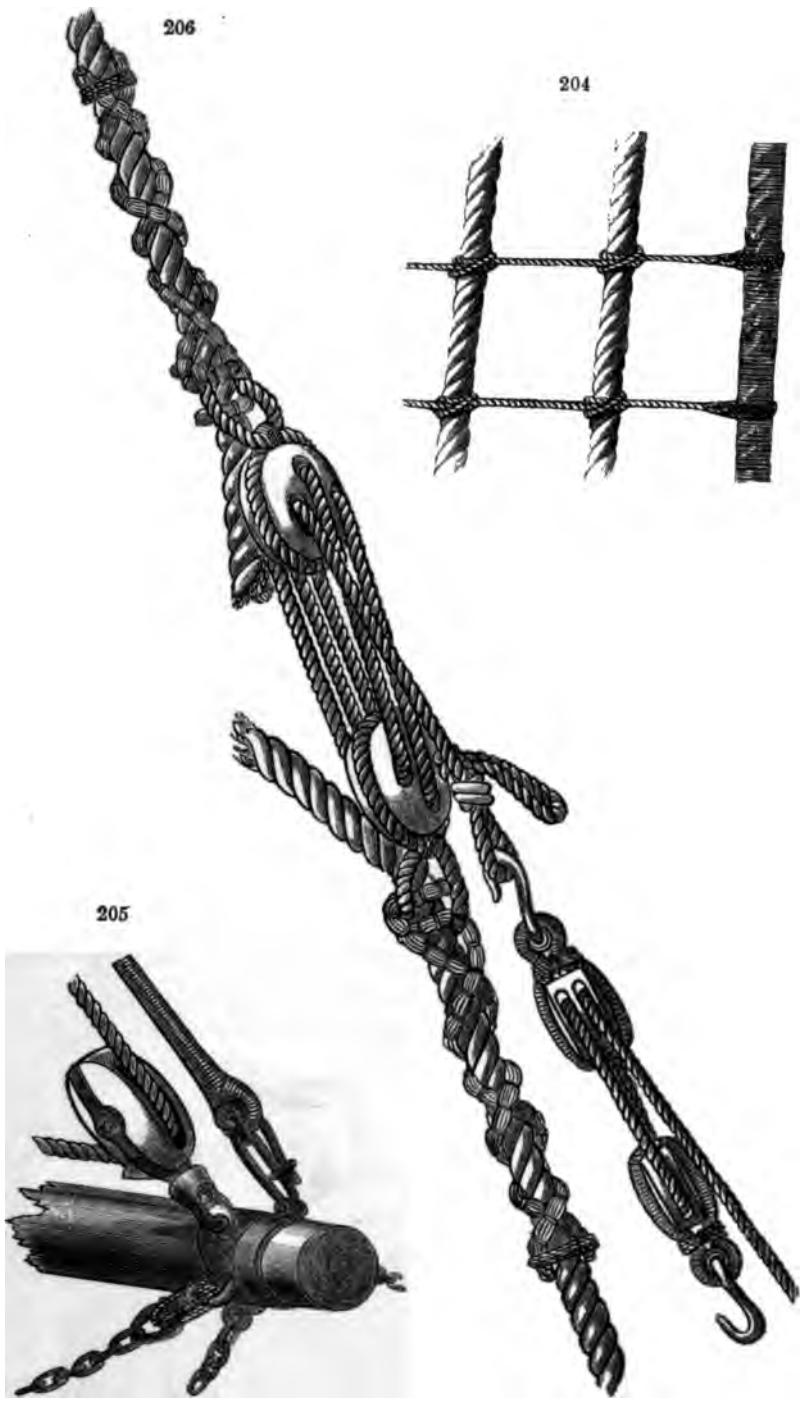
SENDING A SHROUD ALOFT.

202

BUMPKIN—SHROUD CARRIED AWAY.

206

204



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If the dead eyes are turned in, how may a starboard shroud be known from a port one?

By the seizings being aft, and the end of the shroud inside on both sides of the ship.

What is the measurement for the eyes of shrouds?

Once and a quarter round the mast-head.

What is the measurement for the length of the foremost shroud?

From half-way across the mast-head to the outside edge of the channel, abreast the foremost dead eye.

How is the lower rigging cut out?

Having the length of the foremost shroud, place two posts upright at that distance apart: coil the shroud hawser round them, the second coil lying outside the first, flat on the deck, the third outside the second, and so on: cut the bights where the hawser was commenced (Fig. 203).

What proportion must the lanyard be to the shroud?

Half the size.

What proportion must the dead eye be to the shroud?

Once and a half the size, to allow wood enough for the three holes.

What is the use of a sheer pole?

To keep the upper dead eyes square in their places (Fig. 121).

How is the lower rigging protected from being cut by the futtock rigging?

By lashing iron Scotchmen on the shrouds.

How far are the ratlines apart?

Fifteen or sixteen inches (Fig. 204).

In marking the rigging for the ratlines, which shroud would you mark, and why?

The foremost shroud, as the after ones are at an angle; and if marked would make the ratlines lie closer than required (Fig. 297).

Where are the topmast backstays served?

The same distance down from the eye as the topmast shrouds: and also in the part which would touch the lower yards when braced up.

How is the spider hoop for the topgallant shrouds on the topmast fitted?

With a hinge at the forepart and a screw-bolt in the after-

part: there are two rollers on each side of the mast-head for the topgallant shrouds to reeve through.

How are extra topgallant backstays (for putting on the mast-head at sea) fitted?

With an eye-splice lashed to the mast-head above the rest of the rigging.

How are bobstays fitted to preserve the rope?

They are wormed, parcelled and served, the parcelling being put on from the cutwater up towards the heart on each side. Sennit is then put on over the regular service in the centre or lowest part where it goes through the cutwater, and continued up clear of the stem.

How are bumpkins rigged?

With chain shrouds or braces set up with lanyards to the bumpkin end. The fore tack block is shackled to a bolt going through the bumpkin end with a chain connecting the lower part to the ship's side.

What is the use of a topping lift to a spritsail gaff?

It takes the weight off the lee gaff and rigging off the jib-boom; without it the jib-boom would have to support the weight, in addition to the strain of the jib.

What is the use of the steeve of the bowsprit?

It enables the heel of the bowsprit to be properly secured, keeps the head gear out of the water when the ship pitches, and makes the jib a more lifting sail.

Why is there so much pains taken to secure the bowsprit downwards?

Because it has to bear the strain of all the stays coming from the foremast and main topmast. If the forestays were taken to the knight-heads, the bowsprit would not have so many supports (Fig. 245).

If a shroud is shot away, how is it repaired?

Pairs of dead eyes are kept ready fitted—the lanyard is fitted with a Matthew Walker knot and an eye in each end in order to hook the tackle to the most convenient. The dead eyes fitted with two tails each are secured round the two parts of the shroud and the lanyard boused taut, and secured (Fig. 206).

RUNNING RIGGING.—First Part.

Fore royal brace.

Single—from the deck, up through a block stropped to a bolt in the under part of the funnel at the main top-gallant mast-head, and secured to the royal yard-arm with an eye-splice.

(Or from the forecastle up through a block at the fore topmast crosstrees, and then as above.)

Main royal brace.

Single—from the deck, up through a block stropped to a bolt in the under part of the funnel at the mizen top-gallant mast-head, and secured to the royal yard-arm with an eye-splice.

Mizen royal brace.

Single—from the deck, up through a block seized to the main topmast rigging; or through a sheave in the after part of the main topmast crosstree, and secured to the royal yard-arm with an eye-splice.

Fore top-gallant brace.

When single, from the deck, up through a block seized to the foremost shroud of the main topmast rigging, sufficiently high to lead over the main topsail yard when hoisted close up, and secured to the top-gallant yard-arm with an eye-splice.

(Or from the forecastle up through a block secured to the foremast-head, through a block on the fork of the main topmast stay, and secured to the top-gallant yard-arm.)

When double, the brace is rove as before at the main topmast head, then through a block with a single strop round the top-gallant yard-arm, and secured to the foremost shroud of the main topmast rigging, close above the topsail yard when hoisted.

When a pendant and whip is used, the brace is rove as a single brace, with a whip on the up and down part below the main top.

(If the brace were taken higher up in the main topmast rigging, it would cut the foot rope of the main top-gallant sail.)

Main top-gallant brace.

When single, from the deck, up through a block seized to the foremost shroud of the mizen topmast rigging, sufficiently high to lead over the mizen topsail yard when

hoisted close up, and secured to the top-gallant yard-arm with an eye-splice.

When double, the brace is rove as before at the mizen topmast head, then through a block with a single strop round the top-gallant yard-arm, and secured to the foremost shroud of the mizen topmast rigging, close above the topsail yard when hoisted.

When a pendant and whip is used, the brace is rove as a single brace with a whip on the up and down part below the mizen top.

(If the brace were taken higher up in the mizen topmast rigging, it would cut the foot rope of the mizen top-gallant sail.)

Mizen top-gallant brace.

Single—from the deck, up through a block seized to a bolt in the after part of the main lower cap, or to the after shroud of the main topmast rigging below the crosstrees, and secured to the top-gallant yard-arm with an eye-splice.

(Top-gallant and royal lifts and braces are frequently spliced into an iron ring which goes over the yard-arm (Fig. 152). This prevents the inconvenience of the eyes altering in size in wet weather.)

Fore topsail brace.

Double—from the deck, forward through a block secured with a double strop to a bolt in the main-mast close under the trestletrees, through a block on the fork of the main stay, up through the block at the fore topsail yard-arm, and secured to the main topmast head by splicing the two braces together, and stopping each of them down to the fork of the main topmast stays.

(The blocks on the main stay keep the brace from cutting the foot-rope of the main topsail (Fig. 207.)
In a calm, the lee brace chafes the foot of the main topsail, it is therefore sometimes necessary to guy it down by a rope from the gangway.)

Main topsail brace.

Double—from the deck, through a block stropped to a bolt half-way up the mizenmast, through the brace block at the main topsail yard-arm, through a block or thimble stropped into a necklace under the rigging at the mizen topmast head, and secured to a bolt in the after part of the mizen channels.

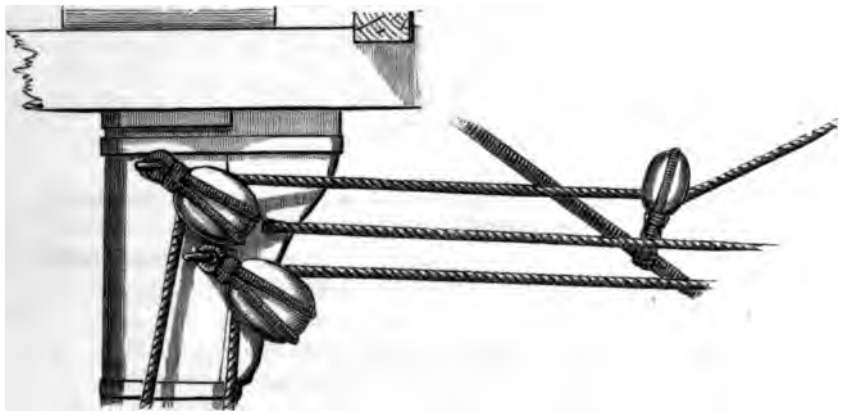
(The standing part being taken down and secured to the channels, takes a considerable strain off the mizen topmast head.)

Mizen topsail brace.

Double—from the deck, through a block stropped to a bolt

FORE BRACE—TOP GALLANT SHEET.

207



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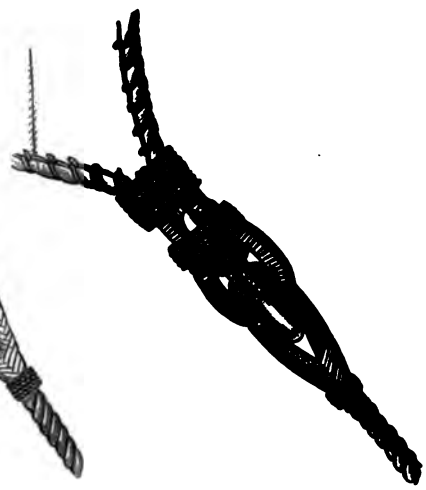


on the after part of the main-mast head, through the brace block on the mizen topsail yard-arm, and secured to the bolt on the main-mast head.

Fore brace.

Double—from the deck, through a block secured with a double strop to a bolt in the main-mast under the trestle-trees, through the brace block at the foreyard-arm, and secured with a Matthew Walker knot through a hole in the knee of the main-mast (Fig. 207).

Main brace.

Double—through a block secured with a long double strop to a bolt and supported by a spider on the quarter (Fig. 10), through the brace block at the main yard-arm, and secured with a purchase on the quarter.

Preventer main brace.

Double—from the deck, through a double block secured with a double strop to a bolt in the foremast under the trestletree, through the preventer brace block at the main yard-arm, back through the double block on the foremast, and down on deck, thus leaving two working ends and no standing part.

The braces cross at the foremast, the starboard brace working on the port side of the deck. This gives a little better angle when bracing up the yard, and when working ship it keeps the main brace and main tack separate.

Why has the preventer main brace no standing part?

In tacking, the main yard flies round so quickly that there is not time to take in the slack of the brace, unless it is rove on the bight and both ends used; then, by catching a turn with one end, and hauling on the other, the brace is doubled.

Why has the main yard two braces?

The preventer main brace is only used for bracing the yard round. The after brace is used for supporting the yard-arm; it cannot be used for bracing the yard round, as it would drag the lee yard-arm down too much.

Crossjack brace.

Double—from the deck, through a block secured to the necklace for the main futtock rigging; through the brace block at the crossjack yard-arm, and secured to the necklace on the main-mast.

Royal lift.

Single—from the top, through a thimble or roller seized in between the two royal backstays close to the mast-head, and secured to the royal yard-arm with an eye-splice; the end is made fast to a thimble which is secured to the eyes of one of the lower shrouds.

Top-gallant lift.

Single—from the top, through a single sister block or roller seized in between the two top-gallant shrouds close to the mast-head, and secured to the top-gallant yard-arm with an eye-splice; the end is made fast to a thimble which is secured to the eyes of one of the lower shrouds.

Top-gallant and royal lifts are frequently spliced into an iron ring which goes over the yard arm (Fig. 152).

Fore or main topsail lift.

Double—from the channels, through the lower sheave of the sister block in the topmast rigging, out through the lift block at the topsail yard-arm and secured with a running cut splice round the topmast head; the standing part is also seized down to the rigging close above the sister block (Figs. 116, 297).

A lift jigger is hooked to the weather lift whenever the topsail is hoisted, and shifted lower down as the reefs are taken in.

Mizen topsail lift.

Single—from the channels, through the lower sheave of the sister block in the topmast rigging, and secured to the topsail yard-arm with an eye-splice.

Fore or main lift (Figs. 244, 260).

Treble—from the deck, up through the fore or after sheave of the lift block which is stropped into a bolt on the side of the lower cap with a single chain strop, in through the lift block at the yard-arm, up through the lift block at the lower cap and secured round the lower yard-arm outside the lift block with a running eye or an eye-splice. The hauling part of the lift is fitted with a purchase (Fig. 189).

By reeving the hauling part of the lift through the after sheave of the lift block, the standing part may be secured on the fore side of the lower yard out of the way of the topsail sheet.

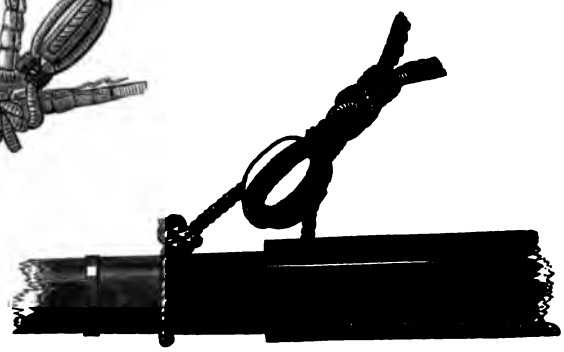
Crossjack lift.

Single—from the deck, through a single block stropped.

TOPSAIL SHEET—CLEW OF COURSE.

210

211



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into the side bolt of the mizen lower cap, and secured to the crossjack yard-arm with an eye-splice.

Royal sheet.

Generally worked in the top; single—from the top, through the after sheave of the quarter block on the top-gallant yard, through a snatch cheek on the after side of the top-gallant yard-arm, or through a sheave in the yard-arm, and toggled to the clew of the royal.

Top-gallant sheet.

From the deck, through the after sheave in the quarter block on the topsail yard, through a snatch cheek on the after side of the topsail yard-arm, and toggled to the clew of the top-gallant sail (Figs. 208, 209).

Topsail sheet.

If rope it is double—from the deck, through the quarter block on the lower yard, through the cheek on the after side of the lower yard-arm, through the topsail sheet block which is stropped into or shackled to the clew of the topsail (Figs. 210, 211), and secured round the lower yard-arm with an outside or inside clinch; the standing part is sometimes secured to a chain-slip fitted at the yard-arm in order to single the sheet when shortening sail. Topsail sheet blocks are fitted with a single strop and a thimble, and shackled to the clew of the sail. If the block were stropped with a double strop, it would lead better to its work.

If chain, single, with a whip—the chain is led through a gin under the quarter of the lower yard, through rollers under the yard, up through the cheek which has a metal sheave on the after side of the lower yard-arm, and shackled or hooked with clasp hooks to the clew of the topsail; the end of the chain has an iron-bound block shackled to it.

The whip is rove through the block on the end of the chain sheet and secured to the bitts.

Fore sheet.

Double—from the waist through a sheave in the ship's side, through the sheet block fitted with a single strop and thimble shackled to the clew of the foresail (Fig. 212), and the end hooked or toggled to a bolt in the ship's side abaft the fore chains. The hook should be moused.

Main sheet.

Double—from the quarter deck through a fair leader in the

ship's side, through a block secured with a long double strop to a bolt in the ship's side and supported by a spider abaft the main channels, through the sheet block fitted with a single strop and thimble (Fig. 212) shackled to the clew of the mainsail, and the end hooked or toggled to a bolt in the ship's side close to the spider. The hook should be moused.

NOTE.—The fore and main sheets are tapered ropes, the end of the hauling part which has the least strain being smaller than the standing part.

Royal clewline.

Worked in the top, single—from the top, through the quarter block on the royal yard, and secured to the clew of the royal with a sennit eye over a split toggle, or the clewline is secured to the royal sheet which is bent to the clew of the royal.

Top-gallant clewline.

Single—from the deck, through the foremost sheave of the quarter-block on the top-gallant yard, and secured to the clew of the top-gallant sail with a sennit eye over a split toggle, or the clewline is secured to the top-gallant sheet which is bent to the clew of the top-gallant sail (Figs. 208, 209).

Topsail clewline.

Double—from the deck, through the foremost sheave of the quarter block on the topsail yard, through the clewline block secured to the clew of the topsail (Fig. 210), and secured with a timber hitch to the quarter of the topsail yard.

The clewline block is fitted with two tails, and knotted or lashed round the clew of the topsail (Fig. 210), two thimbles are fitted in the block-strop, one on each side, through which the clewline is rove—the thimbles keep the bights of ropes and parts of the sail from entering and jamming in the block. Topsail clewlines are frequently taken to the lower cap; having a downhaul tackle on the topsail yard.

Fore or main clew-garnet.

Double—from the deck through the outer quarter block on the lower yard, through the clew-garnet block fitted with a single strop and thimble shackled to the clew of the course (Fig. 212), and secured with a timber hitch to the quarter of the lower yard.

Fore tack (Figs. 205, 245).

Double—from the forecastle, through a fair leader in the ship's side, through the shoulder block at the bumpkin end, through the tack block fitted with a single strop and thimble shackled to the clew of the foresail (Fig. 212), and secured with a slip or running eye over the end of the bumpkin.

Main tack.

Double—through an iron stropped block shackled to a bolt in the waist, through the tack block fitted with a single strop and thimble shackled to the clew of the mainsail (Fig. 212), and secured with a slip to a bolt in the waist.

NOTE.—The fore and main tacks are tapered ropes like the fore and main sheets.

Royal yard rope.

Single—from the deck, through two blocks in the top, through the sheave in the royal mast, and secured to the slings of the royal yard with a double bend, or round the yard with a studding-sail halliard bend.

Royal halliards.

When a purchase is put on the royal yard rope, it is used for and called the royal halliards. The lower block of the two in the top through which the royal yard rope is rove is fitted with a long strop and has a toggle secured to it; it is taken up with the yard rope rove through it, a sufficient height to allow the royal to be hoisted, a half hitch is taken with the yard rope over the two parts of the strop, the bight is then put through the strop above the hitch and toggled (Fig. 190); the other block is secured to the eye of one of the lower shrouds.

Top-gallant yard rope.

Single—from the deck, through the sheave in the top-gallant masthead and secured to the slings of the top-gallant yard with a double bend.

Top-gallant halliards.

A runner and purchase is fitted and put on the yard rope between the top and the deck (Fig. 213), or the top-gallant yard rope is rove through two blocks which form the necessary purchase, the same as the royal halliards (Fig. 190).

Fore or main topsail tye.

Two to each yard—double. The fly-block is seized into an eye-splice in the end of the tye, which is rove forward

through the hanging block at the topmast head, through the tye-block fitted with an iron strop and a swivel on the top-sail yard, and secured round the topmast head with a round turn half-hitch and seizing; or a thimble is seized into the bight of the tye and it is shackled to a bolt in the foremost horn of the topmast trestletree, leaving a long end, which is stopped up and down the topmast rigging and is used for slinging the topsail yard in action, or to assist in shifting it by allowing the tye, when singled, to be lengthened sufficiently long enough to enable the yard to be sent on deck.

Fore or main topsail halliards (Fig. 297).

Two to each topsail yard—one rove as a luff-tackle purchase and the other as a double whip. The lightest purchase for the fore is on the starboard side, and for the main on the port side. The standing part is spliced round the eye of the tye below the fly-block, rove through a single block fitted with a long single strop and hooked to a bolt in the channels, up through the single fly-block, and through a block or snatch sheave on the quarter deck.

The luff-tackle purchase is on the opposite side of the deck. The standing part is spliced round the strop of the single block hooked to a bolt in the channels, rove through the double fly-block, through the single block in the channels, through the double fly-block, and through a block or snatch sheave on the quarter deck.

Mizen topsail tye.

Double—the fly-block is seized into an eye spliced in the end, the tye is rove forward through a sheave in the topmast head under the trestletrees, through the tye-block fitted with an iron strop and a swivel on the topsail yard, and secured round the topmast head with a round turn, half-hitch and seizing, leaving a long end which is stopped up and down the topmast rigging.

Mizen topsail halliards.

The mizen topsail having only one tye, has only one halliard, which is fitted to the tye either with a single or double block, like the fore and main topsail halliards.

A topsail tye is sometimes worked on the bight, being rove through two hanging blocks at the topmast head; two halliards are then required the same as if two separate tyes were used.

Fore top-gallant bowline.

Single—from the forecastle, through a fair leader in the

bows, through a block at the jib-boom end, and secured with a running eye round the toggle on the bowline bridle fitted to the leech of the fore top-gallant sail.

The fore top-gallant sail has two cringles and one bowline bridle on each side of the sail.

Fore top bowline.

Single—from the forecastle, through a fair leader in the bows, up through a sheave in the bees of the bowsprit, and secured with a running eye round the toggle on the bowline bridles, fitted to the leech of the fore topsail.

The fore topsail has three bowline cringles and two bowline bridles (Fig. 249) on each side, the ends of the upper bridle are spliced round the two upper cringles. The lower bridle is spliced round the lowest cringle, and the upper end is spliced round the upper bridle. The toggle is on the lower bridle.

Fore bowline.

Single—from the forecastle, through a fair leader in the bows, up through a block secured to the inner bowsprit shroud collar, and secured with a running eye round the toggle on the bowline bridles, fitted to the leech of the foresail.

The bowline bridles on the foresail are fitted in the same manner as those on the fore topsail.

Main top-gallant bowline.

Single—from the deck, through a sheave in the after part of the fore topmast crosstrees, and secured with a running eye round the toggle on the bowline bridle fitted to the leech of the main top-gallant sail.

The main top-gallant sail has two cringles and one bowline bridle on each side of the sail.

Main top bowline.

Single—from the deck, up through a block on the foremast secured to one of the eyes of the lower shrouds close above the top, and secured with a running eye round the toggle on the bowline bridles fitted to the leech of the main topsail.

The main topsail has four bowline cringles and three bridles (Fig. 250) on each side. The ends of the upper bridle are spliced round the two upper cringles. The ends of the lowest bridle are spliced round the two lower cringles. The ends of the middle bridle which has the toggle on it are spliced round the upper and lower bridles.

Main bowline.

Is a runner and tackle—a strop is fitted on the runner and is toggled to the bowline bridle on the leech of the mainsail with a slip toggle. The runner and the singel block of the tackle are secured to the fore bitts; the lanyard of the toggle is made fast slack to the fore bitts, or round the single block of the tackle.

By letting go the tackle, the strain is brought on the lanyard of the toggle, which being slipped, clears the bowline from the sail (Fig. 214).

The bowline bridles on the mainsail are fitted in the same manner as those on the foresail and fore topsail (Fig. 249).

Mizen top-gallant bowline.

Single—from the deck, through a block secured to the main lower cap, and secured with a running eye round the toggle on the bowline bridle fitted to the leech of the mizen top-gallant sail.

Mizen top bowline.

Single—from the deck, up through a block secured to the futtock necklace on the main mast, and secured with a running eye round the toggle on the bowline bridle fitted to the leech of the mizen topsail.

The bowline bridles on the mizen topsail are fitted in the same manner as those on the fore topsail (Fig. 249).

Lower leechlines.

Two on each side of a course, working together on the bight, one end is secured with a running eye round the leechline toggle on the leech of the sail—the other is rove up before the sail through a single block secured to the jackstay on the quarter of the lower yard (Figs. 215, 216); through a double block secured under the top, through a single block, back again through the double block under the top, through another single block secured to the jackstay on the quarter of the yard (Figs. 215, 216), led down before the sail, and is secured with a running eye round the toggle on the leech of the sail.

The single block through which the bight is rove, has a single whip fitted to it, in the same manner as the lower buntline whip (Fig. 173B).

Lower slablines.

Single, two on each side—from the deck through a double block in the bunt of the lower yard on the fore side, but

MAIN BOWLINE-LEECHLINE AND SLABLINE BLOCKS.

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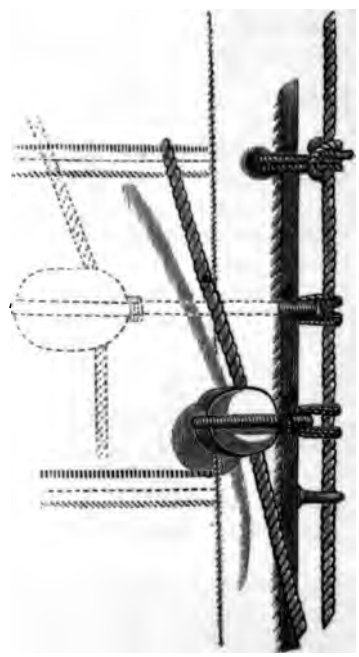

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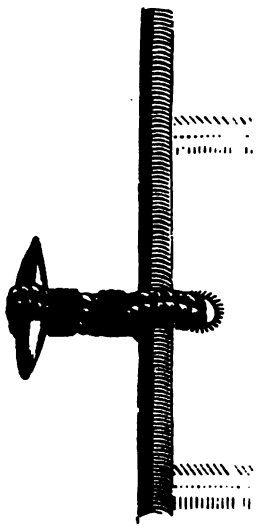

abaft the sail, through a single block secured to the jackstay on the quarter of the yard (Figs. 215, 216), and secured with a running eye round the leechline toggle on the leech of the sail.

NOTE.—The inner leechline and slabline blocks are about one-third out from the bunt of the yard, and the outer ones about two-thirds.

Topsail reeftackles.

Double—from the deck, through the upper sheave of the sister block seized in between the two foremost shrouds of the topmast rigging, through a sheave in the topsail yard-arm outside the rigging, through the reeftackle block secured to the leech of the topsail (Fig. 249), and is secured round the goose neck of the topsail yard with an inside clinch.

Or, instead of through the sister block, fit a pendant from topmast head and splice a single block into the other end, by reeving it through this the topmast rigging is relieved of great strain.

The reeftackle block is fitted with a single strop and a thimble. The reeftackle pendant on the leech of the sail is rove down through the thimble, and is hitched to the upper bowline cringle (Fig. 249).

Two thimbles are fitted into the block strop, one on each side, through which the reeftackle is rove. The thimbles keep the earings, &c. out of, and from jamming in the block.

Lower reeftackles.

Double—from the deck, through a block secured to the same bolt on the lower cap as the lower lift block; through a block or cheek on the foreside of the lower yard-arm, through a block fitted with clasp hooks, and hooked to a cringle on the leech of the sail, and is secured round the goose neck with an inside clinch. A cheek on the foreside of the yard is preferable to a block.

Top-gallant buntline.

Single—from the deck or top, through a block stropped to a bolt under the jack on the foreside of the top-gallant mast, and fitted with a span, each leg of which is toggled to the foot of the sail.

Or, there are two buntlines to each top-gallant sail. Each single—rove through a block under the jack and fitted with a fork; one leg of which is secured to the foot of the sail and the other to the leech, forming a leechline.

Topsail buntlines.

Single—from the deck, through a cheek or block on the foremost horn of the topmast trestletree, through a buntline span, and secured to the buntline toggle on the foot of the topsail with a running eye.

A buntline span is a short piece of rope, with a thimble spliced into one end through which the buntline is rove; they are used to keep the sail when hauled up by the buntlines from being blown away from the yard. At sea they are secured round the tye-blocks, but in harbour, when furling sails, the two spans are tied together behind the topsail tyes; this allows the buntlines to be hauled up higher than the topsail yard.

Lower buntlines.

Double—working on the bight with both ends secured to the sail. One end is secured to the buntline toggle on the foot of the sail with a running eye; the other is rove up through a hole or sheave in the top; aft through a double block secured to the lower cap, through a single block, back again forward through the double block on the lower cap; down through the hole or sheave in the top, and secured to the toggle on the foot of the sail with a running eye (Fig. 217).

The single block, through which the bight is rove has a single whip fitted to it abaft, the two single blocks being stropped into a grummet with a seizing between them (Fig. 173B).

(The lower buntlines are sometimes led through two double blocks under the top, instead of being taken up to the lower cap.)

Peak halliards.

Four parts—from the deck, up through a double block with an iron strop hooked to a bolt on the after part of the mizen cap, out through the outer single block hooked to the spanker gaff, down through the double block on the cap, out through the inner single block on the gaff, and secured to the strop of the double block on the cap (Figs. 246, 247).

The single blocks on the gaff are iron stropped, and hooked with the point of the hook up and aft.

If the standing part is secured round the mizen topmast head, the hauling part is rove through the inner block of the gaff first.

Throat halliards.

Three parts—the upper parts of the purchase are rove

BRAIL BLOCKS—TRYSAIL SHEET

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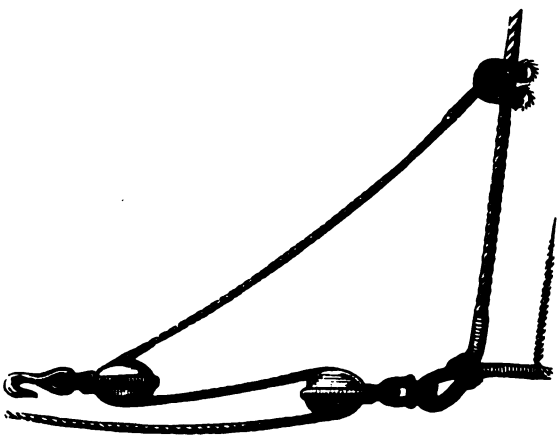

through two sheaves in a cross piece between the after horns of the mizen trestletrees; the lower block is iron stropped and hooked to a bolt in the throat of the gaff (Figs. 246, 247).

The fall is led from the deck, through the foremost sheave in the top, through the single block hooked to the throat of the gaff through the after sheave in the top, and secured to the strop of the single block hooked to the throat of the gaff.

Spanker outhaul.

Double—from the deck, up through a sheave in the end of the spanker boom, through a block hooked or shackled to the clew of the spanker, and secured with a running eye, or spliced into a bolt at the boom end (Fig. 247).

Peak brails.

Single, two on each side of the spanker—the centre of each pair is seized to the after leech of the sail; the ends are rove up, one on each side of the sail, in through single blocks on the gaff, through a double block on each side under the jaws of the gaff, and down on deck (Figs. 246, 247).

All peak brail blocks are fitted in pairs, each block is single stropped, and the pair are joined together with a third strop which lies across the gaff, and the blocks are lashed together underneath (Fig. 218).

Throat brails.

Single—one on each side of the spanker, the centre of the rope is seized to the after leech of the sail, the ends are rove up, one on each side of the sail, down through single blocks stropped to bolts under the jaws of the gaff, and down on deck (Figs. 246, 247).

Foot brails.

Single, two on each side of the spanker—the centre of each pair is seized to the after leech of the sail, the ends are rove up, one on each side of the sail, down through single blocks seized to one of the hoops on the trysail mast, or to the luff of the sail, and down on deck (Figs. 246, 247).

Tack tackle (Fig. 247).

Is a tackle from the tack of the spanker to the deck, the double block is secured to the tack with a slip toggle to enable the tack of the sail to be triced up quickly, the single block is hooked to a bolt in the deck. If a runner

and tackle is used the runner block is secured to the tack of the spanker.

Tack tricing line.

A double whip, from the throat of the spanker gaff to the tack of the sail, the strop of the lower block is likewise secured to the toggle of the tack tackle, on tricing up the tack the toggle is pulled out by the tricing line and the tack freed from the tack tackle, the end of the fall being kept fast to the tack for a downhaul.

Vangs.

Double or single with a whip—from the gaff end to the quarter of the ship.

Spanker boom topping lift.

One on each side of the spanker, double—spliced into a bolt on the boom, through a cheek on the after part of the mizen trestletrees, through a snatch cheek on the boom, and the end fitted with a spliced eye and thimble for the purchase to hook to (Figs. 246, 247).

The purchase is rove in a fiddle and a single block, the fiddle block is hooked to the topping lift, and the single block to a bolt under the spanker boom.

Spanker boom sheet.

One on each quarter, five parts, rove aft through a single block stropped to a bolt on the quarter, aft through a single block stropped to a bolt on the boom, aft through a double block stropped to a bolt on the quarter, forward through another single block on the boom abaft the first one, aft through the double block on the quarter, and spliced into a bolt at the boom end (Figs. 246, 247).

Fore or main trysail gaff.

After being swayed aloft by two top burtons, each is secured in its place by two pendants. The one supporting the throat is hooked to a bolt between the two trestletrees, and the one supporting the peak is fitted with a span and hooked to a bolt on the lower masthead. If the trysail is fitted to haul in and out with hoops on the gaff, the pendant supporting the peak is secured at the extreme end.

Main trysail sheet.

Three parts—from the deck through a single block fitted with a long strop secured to the clew of the trysail,

through a single leading block fitted with a hook and thimble, and spliced into the first reef cringle (Fig. 221).

By taking the standing part up to the first reef cringle, the after leech is hauled tauter.

In tacking, a trysail is brailed up, the sheet shifted over the stay, and hauled aft on the other side of the ship.

Trysail brails and vangs.

Same as spanker.

Trysail outhaul.

Single and a whip—the whip is fitted at the end of the outhaul, which reeves through a block at the lower mast-head through a sheave in the end of the gaff, and is spliced into the head clew of the trysail.

Trysail inhaul.

Single and a whip—the whip is fitted at the end of the inhaul, which reeves through a block on the throat of the gaff, and is spliced into the head clew of the trysail.

Flying jib halliards.

Single, from the port side of the deck, forward through a block stropped to a bolt under the jack at the foretop-gallant mast-head, and secured with a single bend to the head of the flying jib.

NOTE.—The block is sometimes fitted with a strop to go over the funnel at top-gallant mast-head between the top-gallant and flying jibstay.

Jib halliards.

Single—from the starboard side of the deck, through a hanging block shackled to the after leg of the necklace at the fore-topmast head (Fig. 116), and secured with a single bend or clasp hook to the head of the jib. It is sometimes rove through two blocks at the masthead.

Fore-topmast staysail halliards.

Double—from the deck through a hanging block shackled to the foremost leg of the necklace at the fore-topmast-head (Fig. 116), through a block hooked to the head of the stay-sail, and secured to the eye of the fore-topmast stay, being also stopped to the fork.

Flying jib sheets.

Single—rove on the bight, the centre of the rope has a half-crown and a thimble seized into it, which is lashed or toggled to the clew of the flying jib. Each sheet is led through a fairleader on the spiritsail gaff, and through one in the bows on to the forecastle.

Jib sheet.

A whip and pendant. The pendant is fitted on the bight, the centre of the rope has a half-crown and a thimble seized into it, which is lashed or toggled to the clew of the jib (Fig. 222), and a single block spliced into each end. The sheet is rove through a fairleader in the bow, through the block at the end of the pendant, and spliced into a bolt in the bow; or a single purchase is fitted to the standing part, and led through a fairleader in the bow.

Fore-topmast staysail sheet.

Same as jib sheet (Fig. 222).

Flying jib downhaul.

Single—from the forecastle through a fairleader in the bow, through a block at the flying jib-boom end, through two or three turns of the lacing or fairleaders on the luff of the flying jib, and secured to the head of the sail with a single bend.

Jib downhaul.

Single—from the forecastle, through a fairleader in the bow, through a block secured at the jib-boom end, through three or four turns of the lacing or fairleaders on the luff of the jib, and secured to the head of the sail with a single bend.

Fore-topmast staysail downhaul.

Single—from the forecastle, through a fairleader in the bow, through a block seized to the fore-topmast stay, through three or four turns of the lacing or fairleaders on the luff of the stay-sail, and secured to the head of the sail with a single bend.

Jib and flying jib lacing.

Is spliced into the upper eyelet hole in the sail, rove round the stay against the lay of the rope, and through each eyelet hole in the luff, being stopped at each (Fig. 224), the upper eyelet hole has also a grummet worked round the stays, made as small as possible, but of large rope.

RUNNING RIGGING.—Second Part.

Jib heel rope.

Double—from the forecastle, through a block stropped round the bowsprit cap, or hooked to a bolt in the cap,

JIB PENDANT—SHEET AND LACING.

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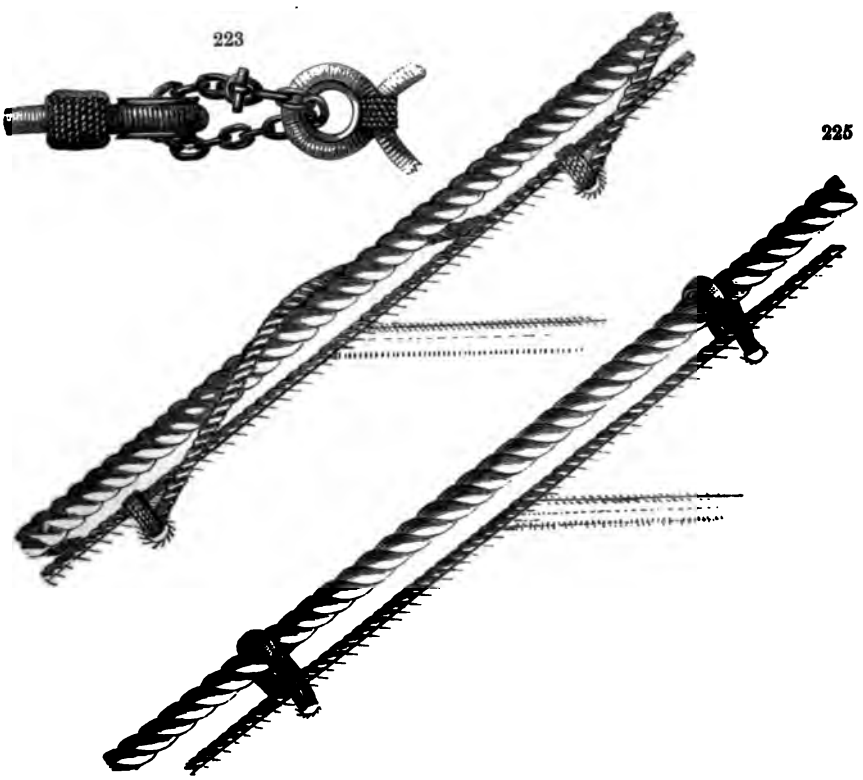

through a sheave in the heel of the jib-boom, and hitched to the strop or a bolt on the opposite side of the bowsprit cap. The strop is fitted with a thimble in one bight, and a block in the other, placed across the cap, and lashed on the after side (Fig. 241).

Flying-jib heel rope.

Single—from the forecastle, through a block hooked to a strop at the jib-boom end, and knotted through the heel of the flying jib-boom.

Top tackle pendants.

Double—two to the fore and main topmasts, one to the mizen. The after end has an eye spliced round a thimble for the upper block of the top tackle fall to hook to; the other end is rove through the top block, which is a single iron bound block hooked to the after bolt in the lower cap, through the sheave in the heel of the topmast, and hitched to the foremost bolt on the opposite side of the cap.

(There are two sheaves in the heel of the fore and main topmasts, one for each pendant—one above and the other below the fid hole—the latter is a dumb sheave formed by scoring the heel of the mast, and lining it with iron or by introducing three brass rollers—there is not sufficient wood for a whole sheave.)

Top tackle falls.

Seven parts—rove in two treble iron bound blocks. The upper one is hooked to the eye in the after end of the top tackle pendant, and the lower one to a bolt on the main deck, or to a chain led from the main to the upper deck. The standing part of the fall is clinched round the iron strop of the upper block (which has a swivel), the hauling part being rove through a leading block, whose single rope strop is fitted round the iron strop of the lower block.

Top-gallant mast ropes.

Double—from the deck, through a sheave in the topmast cap, through the lizard, through the sheave in the heel of the top-gallant mast, and secured with a half hitch and seizing to the foremost bolt on the opposite side of the top-mast cap (Fig. 10*c*). The standing part, instead of being secured to the cap, is sometimes fitted of larger rope, rove through a block hooked to the cap, and a tackle hooked to it—this is handy for the last pull in fidding the mast.

(In shifting a top-gallant mast, if a common sheave is used, the standing part of the mast rope must be cast off, unrove, rove through the new mast, and sent aloft

again with a hauling line. If the mast is fitted with a snatch sheave below the fid hole, the standing part may be kept fast; but then, if the mast lands on anything in its way down, the mast rope might come unsnatched—to prevent this, a bolt is put through the mast below the sheave, and forelocked in.)

Lizard for top-gallant mast rope.

A single piece of rope spliced round a thimble on the hauling part of the mast rope, when the end is hitched through the royal sheave hole (or through a hole bored on purpose)—it keeps the top-gallant mast from turning over when the mast-head comes below the topmast cross-trees.

Jears.

Five parts—from the main or lower deck, through a fair-leader in the decks above, through the double block under the top and the two single blocks on the yard; the standing part being secured round the trestletree, the upper jear block strop, or the lower masthead.

Short jears.

Four parts—the standing part is timber-hitched round the yard, rove through the double block under the top, and the two single blocks on the yard, the end being hitched round all parts. The short jears are kept rove as preventer slings.

Bill tricing line.

Single—from the deck forward through a block seized to the foremost shroud abreast the lower yard. The end is fitted with a long eye for bending to and unbending from the lower block of the yard tackle.

Quarter tricing line.

Single—from the deck, through a block in the bunt of the lower yard, through a cheek (or block) on the quarter of the yard, and secured to the centre of the fiddle block of the yard tackle (Figs. 134, 135).

Cat fall (Fig. 288).

Six parts—from the forecastle, down through the foremost sheave in the cat head, through the cat block and sheaves in the cat head, the standing part being secured with a timber hitch round the cat head inside the sheaves.

The cat block is treble and iron-bound, and always hooks towards the ship's side.

Cat backs (Fig. 288).

One is fitted with three legs spliced into bolts in the foremost side of the cat block, to support it with the sheaves

and hook lying horizontal; the other is secured to the back of the hook. They are led through leading blocks on the bow or in the head.

Cat head stopper (Figs. 288, 295).

Is rope with a short length of chain spliced on at one end, the end link goes over the tumbler on the foreside of the cat head; the rope end is rove through the ring of the anchor from out in, over a roller on the afterside of the cat head, and secured round a bollard head with two or three round turns, and the end seized down to a bolt.

Shank painter (Fig. 295).

Is rope with a short length of chain spliced on at one end, the end link goes over the tumbler in the ship's side, the stopper is rove round the shank of the anchor over and under, and secured in the same way as the cat head stopper.

The stoppers for heavy anchors are fitted with only a few links of chain to pass round the anchor, and then a rope strop and thimble at the end to go over the tumblers. This is lighter than having a long piece of chain.

Fish fall (Fig. 288).

Five parts—from the forecastle out through a leading block lashed to the mast-head pendant down through a leading block on the fore side of the fish davit, through the lower fish block and the double block on the fish davit, and the standing part secured round the strop of the lower fish block, which is a double block fitted with a long double strop, and a large hook to take the fluke of the anchor.

Fish back (Fig. 288).

From the forecastle, and secured to the back of the fish hook.

Fish topping lift.

An up-and-down tackle; the double block is lashed to the mast-head pendant, and the single block is hooked to a bolt in the davit head.

Or a runner and tackle, the runner block being stropped round the davit head, and the runner and tackle secured round the foremast, the leading block being hooked to a strop round the mast (Fig. 283).

Fish martingale (Figs. 283, 288).

A large jigger, the double block secured to one of the bolts

in the davit head, the single block hooked down to a bolt in the ship's side.

It keeps the davit from topping up as the fish fall is hauled taut. If the martingale were not taut, the davit head would top up backwards, and the heel of the davit come out of the shoe.

Stock pendant and tackle.

Is a pendant and a luff tackle—the pendant is fitted with a running eye to go over the end of the outer arm of the anchor, and a spliced eye and thimble for the tackle to hook to.

The stock pendant is used to keep the lower arm of the stock clear of the ship's side.

Top-gallant studding-sail halliards (Figs. 259, 260).

Single—from the deck, up abaft all through the span block at the top-gallant mast-head, down the fore side of the top-gallant yard, through the jewel block at the yard arm, and bent to the studding-sail yard.

The two span blocks are fitted into one strop, with lashing eyes lashed together round the top-gallant funnel (Fig. 226).

Topmast studding-sail halliards (Figs. 259, 260).

Single—from the deck, up through the span block at the topmast cap, down the fore side of the topsail yard, but abaft the top-gallant studding-sail boom, through the jewel block at the yard arm (Fig. 228), and bent to the studding-sail yard.

The span blocks are fitted into a long single strop, a block being seized into each bight. The strop is placed across the topmast cap, leaving one block hanging down on each side; they are then lashed together under the cap (Fig. 227).

Lower studding-sail halliards (Figs. 259, 260).

Single—from the forecastle, up through a block fitted with a long pendant hanging from the fore topmast head, down the fore side of the fore topmast studding-sail boom through a block at the boom end (Fig. 151), and bent to the studding-sail yard.

(If a topping lift is used, a fiddle block is fitted in the pendant at the topmast head. The topping lift is rove through the upper, and the lower halliards through the lower sheave of the block.)

Inner halliards (Fig. 259).

Double—the upper block is stropped to a bolt on the foremast under the top; the lower block, fitted with a tail, is

SPAN AND JEWEL BLOCKS.

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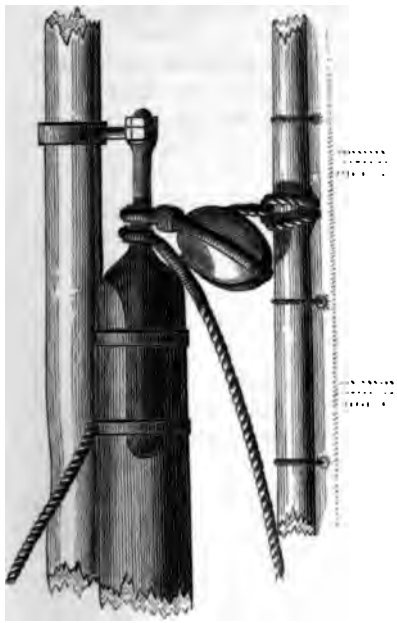

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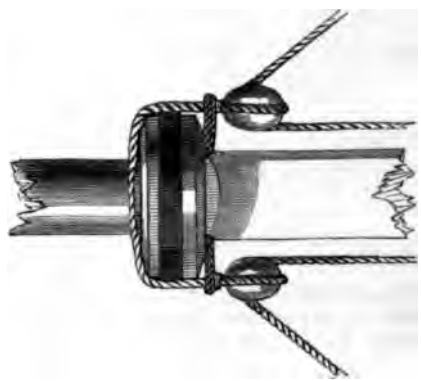


secured to the inner head cringle of the lower studding-sail.

Top-gallant studding-sail tack (Fig. 259).

Single—from the top, through a block secured to the after dead eye of the topmast rigging, forward over the top-gallant studding-sail boom, through the tack block at the boom end, and secured with a running eye over the toggle in the clew of the studding-sail (Fig. 229).

Main topmast studding-sail tack.

Single—through a block on the quarter, led over the top-mast studding-sail boom, through the tack block fitted with a double strop at the boom end, and secured with a running eye over the toggle in the clew of the sail.

Fore topmast studding-sail tack (Fig. 259).

Single—through one sheave of a double block secured with a long tail and a lashing to three or four shrouds in the main rigging close above the ridge rope, rove and secured in the same manner as the main topmast studding-sail tack.

Boom brace.

A pendant and whip—the pendant is secured with an eye-splice over the fore topmast studding-sail boom end (Fig. 151), and a block stropped into the other end; the whip is rove with the studding-sail tack through the double block in the main rigging, through the block in the end of the pendant, and secured to the main rigging.

Lower studding-sail tack (Fig. 259).

Single—from the waist through a sheave in the ship's side, over the lower boom, through the tack block fitted with a double strop at the boom end, and secured with a running eye over the toggle in the clew of the sail.

Top-gallant studding-sail sheet (Figs. 259, 260).

Single—spliced into the inner clew of the studding-sail, led down abaft all into the top, and secured to the slings of the lower yard above the top.

Topmast studding-sail sheets (Figs. 259, 260).

A rope is secured on the bight to the inner clew of the studding-sail with a single bend, leaving two parts forming a long and a short sheet, the short reeves through a block secured to the inner boom iron on the lower yard, and secured in the top. After the sail is set the long sheet comes down before the course, and is belayed on deck.

Lower studding-sail sheets (Fig. 260).

Two parts—the rope is secured on the bight to the inner clew of the studding-sail with a single bend; one reeves through a block secured to the goose neck of the lower boom (or in the fore chains), through a port on to the forecastle. The other is led over the hammock netting and belayed, to assist in taking the sail in.

Top-gallant studding-sail downhaul.

Single—spliced into the inner head clew of the studding-sail and round the yard arm inside the earing, and led down abaft all into the top.

Topmast studding-sail downhaul (Fig. 260).

Single—from deck, through a block stropped round the tack of the studding-sail, up through fairleaders in the outer leech of the sail, and spliced into the outer head clew, and round the yard arm inside the earing.

Lower studding-sail tripping line (Fig. 260).

Single—from the forecastle, through a block on the foremast under the top, through a block stropped round the inner studding-sail yard arm, down the fore or after side of the sail, through a thimble secured in the midship part of the sail, and bent to the tack with a single bend.

(If the tripping line is led down before the sail, the studding-sail is easier taken in than if it is led down abaft all; but the rope chafes the sail if it remains long set.)

The lower tripping line is also used for tricing up the studding-sail gear when the sails are not set.

Lower studding-sail boom topping lift (Fig. 260).

A pendant and tackle—the pendant is spliced into a bolt on the boom, rove through the long lizard block or thimble, and through a block on the foremast under the top, the double block of the tackle is stropped into the end, the single block of the tackle is hooked in the fore chains.

Long lizard.

A pendant fitted with a block or thimble running on the lower boom topping lift. When getting the lower boom out, it is secured to the goose neck on the fore yard as short as possible. When the boom is square it is eased in.

(It is found very convenient to fit the long lizard as a standing rope, reeving it through a block on the foremast under the top, and through a block lashed to the goose neck at the yard-arm.)

Fore guy.

Single or double—from the forecastle, through a cheek on the bees of the bowsprit, through a block at the end of the spritsail gaff, and spliced into a bolt on the lower studding sail boom.

If double—it is rove through a block on the boom, and secured at the end of the spritsail gaff.

After guy.

Single—from the waist, through a sheave in the ship's side, and spliced into a bolt on the lower studding-sail boom.

Topmast studding-sail boom jigger.

Double—the upper single block is hooked to a bolt or strop under the top, the lower block to the bolt in the inner end of the boom, the fall is led on deck. When the boom is to be rigged out, the upper block is shifted from under the top to a strop on the boom iron. To rig the boom in, hook the upper block to the slings of the yard.

Top-gallant studding-sail boom tricing line.

Single—from the top, through a block seized to the foremost shroud in the topmast rigging close to the cross-trees, and spliced into the bolt in the inner end of the boom.

Top-gallant studding-sail boom back.

Single—from the top, through a thimble secured to the foremost shroud of the topmast rigging, about four feet above the yard, and spliced into the bolt in the inner end of the top-gallant studding-sail boom.

TANKS, BALLAST, PROVISIONS, &c.

The three principal dimensions of square tanks:—

Top of Tank.	*Height.*	*Contents.*
4 ft. 1 in. square.	6 ft. 1 in.	600 gals.
4 ft. 1 in. do.	5 ft. 1 in.	500 gals.
4 ft. 1 in. do.	4 ft. 1 in.	400 gals.

How many gallons make a ton?

224.

NOTE.—On board ship a ton is generally taken as 210 gallons, or even less than that, to allow for wastage, &c., thus, a tank containing 400 gallons, is often called a two-ton tank.

What are bilge tanks?

Tanks with one of the lower edges cut off, in order to fit the side of a ship.

How are tanks slung for sending below?
By a toggle in the manhole.

Explain how tanks are stowed.
A skeleton floor is built at the bottom of the hold, and the tanks selected to correspond, so as to leave the top of them all as level as possible after being stowed, the midship ones are therefore the tallest, and bilge tanks are used close to the ship's side. The spaces left between the tanks are filled in with wood, and caulked. The manhole, which is usually in the corner of a tank, is placed so as to have four close together in rows along the hold; this enables gear to be stowed along the opposite part of the tanks, keeping the holes clear

The two principal dimensions of pigs of ballast:—

Weight.	*Length.*	*Ends.*
3 cwt.	3 ft.	6 inches square.
1½ cwt.	1½ ft.	6 inches square.

Why do not steam ships require as much ballast as sailing ships?
The weight of the engines, boilers, coal, &c., is sufficient ballast for a steam ship; they only carry a little to preserve their trim.

What are wet provisions?
Beef, pork, suet, vinegar, rum, and lime juice.

What are dry provisions?
Peas, oatmeal, chocolate, tea, flour, raisins, sugar.

What slops are stowed on board?
Bales of cloth, flannel, duck, and bedding; casks of soap, shoes, and tobacco.

Which are stowed nearest amidships, wet or dry provisions?
Wet, because they are the heaviest.

What is dunnage?
Pieces of firewood used in stowing the casks.

How do you find the bung of a cask?
It is between the rivets of any two opposite hoops.

How are casks stowed?
Bung up, lying fore and aft.

When new provisions arrive, where will you stow them?
Under the old, so as to use the old first.

What is meant by shaking a cask?
Knocking it to pieces, then making a bundle of the staves and hoops.

Staves of a cask.
The pieces of wood forming the sides.

Bilge of a cask.
The largest circumference.

Chimes of a cask.
The projection of the staves beyond the head.

STOWAGE, &c. FOR A LINE-OF-BATTLE SHIP.

Where is the sail room?
On the orlop deck, amidships, by the foremast.

What is stowed there?
The shroud hawser, and the sails.

A ship is supplied with three suits of sails, two of which are fitted, and one not fitted.

Where are the bag racks?
In the fore cockpit, and on each side of the sail room.

Where are the tiers?
On the orlop deck, on each side over the engine room.

What is stowed there?
The hemp sheet and stream cables, hawsers for the kedge, &c., rope messenger, nippers, anchor gear, runners and tackles, up and down tackles, hammock gantlines, clothes-lines, &c.

Where are the wings?
Between the tiers and the ship's side. All cockpit cabins are fitted with doors, which, when open, allow a clean walk round the ship inside, close to the ship's side.

What are they for?
To allow room to plug up any shot holes which might be made close to the water's edge.

What is stowed there?
Top blocks, spare topmast cap, cat and fish blocks, shot plugs, &c.

Where is the issue room?
Aft, on the orlop deck.

What is stowed there?
The present issue provisions.

Where are the store rooms?
Foreward, below the fore cockpit.

What is stowed there?
All the gunner's, boatswain's, and carpenter's stores.

How many magazines are there?
Two—the fore magazine and the after magazine.

How and where are they lighted?
By a light room outside, with a bull's-eye between it and the magazine.

What are the handing rooms for?
For the powder not to pass on deck straight from the magazine. It is passed through fearnought shoots from one handing room to the other, and then on deck.

Where is the fore hold?
Between the fore magazine and the boilers.

What is generally stowed there?
Tanks for water, water casks, mess tubs, boats' anchors, grapnels, spare boom irons, anchor buoys, &c.

Where are the coal bunkers?
They run along on each side of the ship below the orlop deck.

How are they filled?
By shoots leading from the lower deck through the orlop deck down to the coal bunkers.

Where is the main hold?
Abaft the engine room.

What is generally stowed there?
If large enough, tanks for water, spare lower cap, mooring swivel, purchase blocks, &c.

Where are the chain-cable lockers?
On each side of the mainmast outside the well.

Where are the shell rooms?
Close abaft the chain lockers.

How are they lighted?
With lamps outside, and a bull's-eye between.

Where is the spirit room?
Abaft the main hold.

What is stowed there?
The spirits and slops?

Where is the after hold?
Between the spirit room and the after magazine.

What is stowed there?
All the provisions.

Where is the bread room?
In the run of the ship below the issue room.

Where are the hammocks stowed?
On deck in the hammock nettings, which are fitted all round the ship on top of the bulwarks.

Where are the shot lockers?
They vary in different ships; but are generally on each side of the fore magazine. A supply of shot is kept on the different decks round each hatchway.

Where are the top-tackle pendants and falls, and the jeers stowed?
On rollers close to the hatchways on the orlop deck.

Where is the well?
A bulkhead fixed round the mainmast and pumps, forming a passage down to the limbers.

BERTHING, &c.

How are hammocks berthed?
The numbers come in proper order, working athwartships; thus leaving an empty hammock on each side a full one, when either watch is on deck.

Where do boatswain's mates sleep?
Close to the hatchways.

Where do the daymen and boys sleep?
In the fore cockpit and galley, so as not to be disturbed when the watches are called.

How many hammocks has each man?
Two. They are marked with the man's number on the watch-bill, one hammock having a black and the other a white patch.

How many bags has each man?
One, marked with the man's number on the watch-bill.

How are the men generally numbered on the watch-bill?

Odd numbers, starboard watch—even numbers, port watch; Chief Petty Officers come first, then Boatswain's Mates, Quarter-masters, Forecastle Men, Fore, Main, and Mizen Top-men, Afterguard, Gunners, Marines, Daymen, Boys, and Firemen.

How are the men in the starboard watch distinguished from those in the port?

By a mark on the right arm for the starboard, and one on the left for the port watch.

How are the ship's company divided into watches?

Two watches—starboard and port. Each watch is divided into two parts, and in large ships, each part into two divisions.

Working ship with the hands, how do you divide the men?

Starboard watch work on the starboard side of the deck; port watch—port side.

Working ship with the watch, how do you divide the men?

1st part work the starboard side; 2d part—port side.

How are the watches divided during the twenty-four hours?

The *afternoon watch* is from noon to 4; 1*st dog-watch* from 4 to 6; 2*d dog-watch* from 6 to 8. *The first watch*, from 8 to 12; *middle watch* from 12 to 4; *morning watch* from 4 to 8; and *forenoon watch* from 8 to noon.

How are the men divided into messes?

One mess between each gun on the lower deck. Each mess belongs one half to the starboard, and the other half to the port watch, so that the weight of the men may be equally distributed on each side of the ship when one watch is on the deck.

Where do the daymen and boys mess?

Distributed amongst the other messes. If messing by themselves, they could not commence work until the lower deck were cleaned.

Where do the marines mess?

In the after messes.

RULE OF THE ROAD AND VESSEL'S LIGHTS.

Ships on a wind passing close—The one on the starboard tack keeps the wind, port tack gives way.

Ships running give way to ships on a wind.

Vessels steering directly for each other, to prevent collision, should port the helm, or pass on the port side of each other.

Steamers' lights are—red on the port side, green on the starboard, white light at the mast-head.

(This may be remembered by port wine being red.)

Sailing ships' lights are the same as steamers', with the exception of the light at the mast-head.

At anchor—all vessels carry a white light at the mast-head only.

Fog-signals—to be sounded at least every five minutes.

Steam ships under weigh shall use a steam whistle.

Sailing ships under weigh shall use a fog horn.

Steam ships and sailing ships when not under weigh shall use a bell.

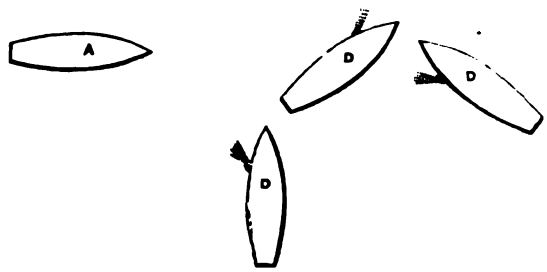
A sees B's red and green light, and knows B is steering directly towards her, on the opposite course to A.

If B has a white mast-head light above the green and red, A knows B is a steam vessel.

RED LIGHT SEEN.

A vessel is approaching A on her port bow and will pass on the port side of her.

Or is crossing in some direction to port, as D.

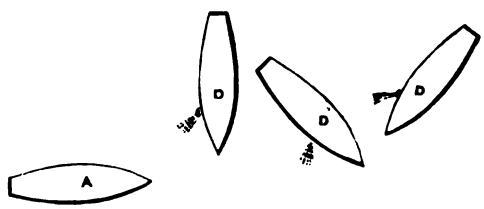


If A sees a white light above the red, she knows D to be a steamer, crossing to port in some direction.

GREEN LIGHT SEEN.

A vessel is approaching A on her starboard bow, and will pass on the starboard side of her.

Or is crossing in some direction to starboard, as D.



If A sees a white light above the green, she knows D to be a steamer passing to starboard in some direction.

SEA TERMS.

Weather side ..... The side against which the wind blows.

Lee side ..... The opposite to the weather side.

Starboard tack..... Sailing as nearly as possible in a direction towards the wind, with it blowing against the starboard side of the ship, and consequently the starboard tacks being in use.

Port tack ..... Sailing as nearly as possible in a direction towards the wind, with it blowing against the port side of the ship, and consequently the port tacks being in use.

Tacking .....
Going about .....
Staying ..... } Going round from one tack to the other, passing head to the wind.

Wearing ..... Going round from one tack to the other, passing stern to the wind.

Beating to windward.. Proceeding as nearly as possible in a direction towards the wind, and continually tacking.

To weather .... .. To pass on the weather side of anything.

On a wind .....
By the wind.....
Close hauled..... } Sailing as close to the wind as possible.

Wind abeam..... Sailing with the wind directly on one side, or at right angles to the keel.

Off the wind ....
Going free .....
Sailing large ....
Running ..... } Sailing with the wind on the beam or quarter.

Before the wind .... Having the wind exactly aft.

Scudding..... Running before a gale of wind.

Conning ..... Directing the helmsman in steering the ship.

Keep her away....
Bear up ..... } To alter course, turning the ship's head more away from the wind.

Luff..... To alter course, bringing the ship's head nearer to the wind.

Steady
Very well thus } To keep the ship's head steady in the same direction.

Nothing off..... To bring the ship's head nearer to the wind.

No higher..... Not to bring the ship's head nearer to the wind.

NOTE.—The three last terms are used when the ship is sailing close hauled.

Starboard (the helm) To alter course by putting the tiller or helm to starboard, so as to force the rudder and ship's head to port when the ship is going ahead.

Port (the helm) .... To alter course by putting the tiller or helm to port, so as to force the rudder and ship's head to starboard when the ship is going ahead.

Hauling to the wind.. Altering course, bringing the ship's head as near to the wind as possible.

Hove to ..... Keeping the ship stationary, by making one sail act against another.

Lying to ..... Keeping the ship to the wind in a gale with little sail.

Making a sternboard . Trimming the sails so as to force the ship astern.

Stern way..... Going astern.

Lee way ..... Going sideways away from the wind.

Brought by the lee .. When running, if the wind changes from one quarter to the other.

Broaching to ..... When running with the wind on the quarter, and the ship's head comes up towards the wind, in consequence of a sea striking the stern, or through bad steerage.

Gybing a sail ..... When running nearly before the wind, if the wind gets on the lee side of a fore and aft sail, blowing it over to the other side of the ship.

Weather tide ..... A tide which will carry the ship towards the wind or to windward.

Lee tide ..... A tide which will carry the ship away from the wind or to leeward.

Bearing..... The situation of any distant object in relation to the ship.

Striking a mast .... Sending the mast down on deck.

Housing a mast .... Lowering the mast down as low as possible without taking the rigging off the masthead.

Single anchor ..... Having only one anchor down.

Moored ..... Having two anchors down.

Moorings..... Anchors and chains laid down ready for a ship to be secured to them.

Short stay ..... When the cable is nearly straight up and down from the ground to the bows of the ship; or when the amount of cable out is a little more than the depth of water.

Long stay..... When the anchor is some distance ahead, and the cable forms a small angle with the ground.

Foul hawse ..... When moored, if one cable is twisted round another.

To veer cable ..... To ease away or pay out the cable.

Surging ..... The hawser slipping up the barrel of a capstan, or veering out the cable suddenly.

Warping ..... Using a hawser to haul the ship ahead.

Kedging ..... Using a kedge anchor to warp the ship ahead by when there is no place to secure a hawser to.

A spring ..... A rope led from aft and made fast to the cable, or an object a short distance off, in order to turn the ship's head round, and present her broadside to any required direction.

Adrift ..... Broken loose from the moorings.

Woolding..... A strong lashing round a spar or spars. After passing the turns it is wedged out to tauten them.

Binnacle ..... A box containing a compass.

Lubber's point..... A mark on the foremost side of the compass bowl, through which, if a line were drawn from the centre of the compass, it would be parallel to the keel. It shows the helmsman how the ship's head is pointing with regard to the compass.

Guesswarp ..... A rope used to secure or haul a boat ahead with.

(In laying out a guesswarp, the whole hawser is taken in the boat, and the end is brought back to the ship, the distance being "guessed.")

Weighing..... Getting the anchor out of the ground and up to the bows.

Casting..... Trimming the sails in order to turn the ship's head round away from the anchor after weighing.

Boxing off ..... Backing a head sail in order to pay the ship's head off if she has approached too near the wind, in consequence of bad steerage, or the wind drawing ahead.

Backing and filling .. Trimming the sails in order to go backwards and forwards across a river, letting the tide take the ship to windward.

Sued..... The condition of a ship when she has run ashore, and the water has partly left her. If the water has left her two feet, she has sued two feet.

The buoy watching .. The anchor buoy being above water.

Setting up rigging .. Hauling the shrouds, &c., taut by means of tackles on the lanyards.

Swifting in ..... Steadying the shrouds in their places before putting on the ratlines. Also done in a gale of wind when rigging becomes slack.

Spar down ..... Putting spars in the rigging for the men to stand upon whilst rattling down.

Scotchman ..... A piece of hide, wood, or iron on a rope to prevent its being chafed.

Swamped..... A boat being filled with water.

Batten down..... Closing the hatchways with gratings and tarpaulings.

Wake of a ship .... The track left by a ship in the water.

Bonnet of a sail .... An additional part made to lace on to the bottom of a trysail or other sail. By taking the bonnet off, the sail becomes a storm sail.

Hogging ..... Scrubbing the ship's bottom under water.

Hogged..... The bow and stern of the ship having settled down in the water below the level of the midship part.

Sagged..... The midship part of the ship having settled down below the level of the bow and stern.

Athwart ..... Lying across any part of the ship.

SENDING A CROSSTREE ALOFT.

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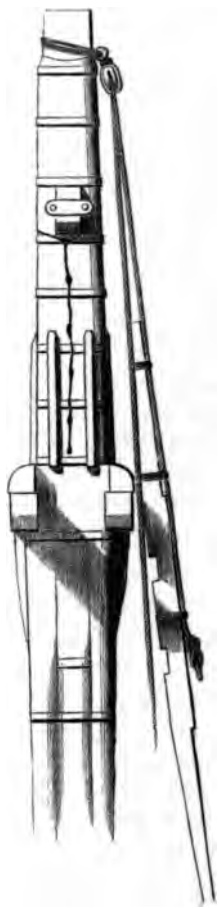

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PLACING A TOP.

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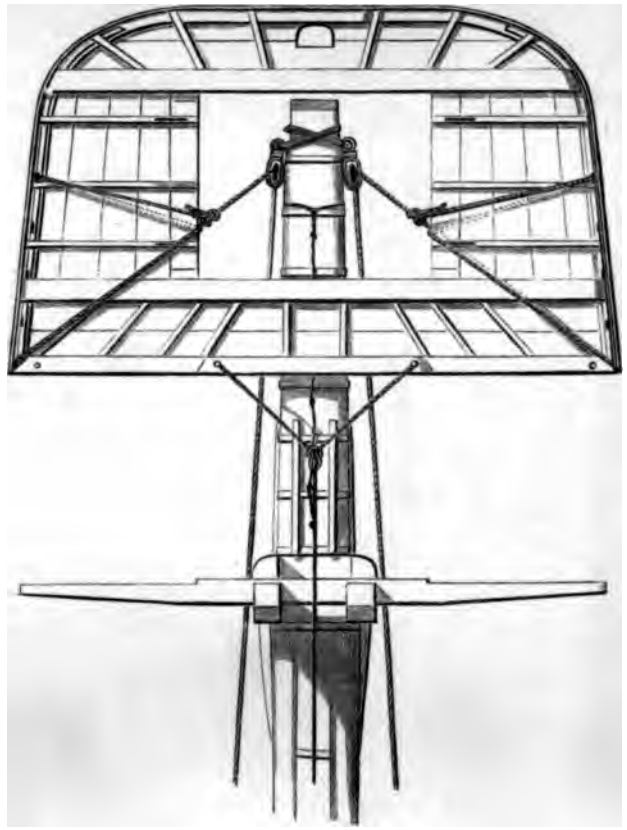

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PLACING A HALF TOP.

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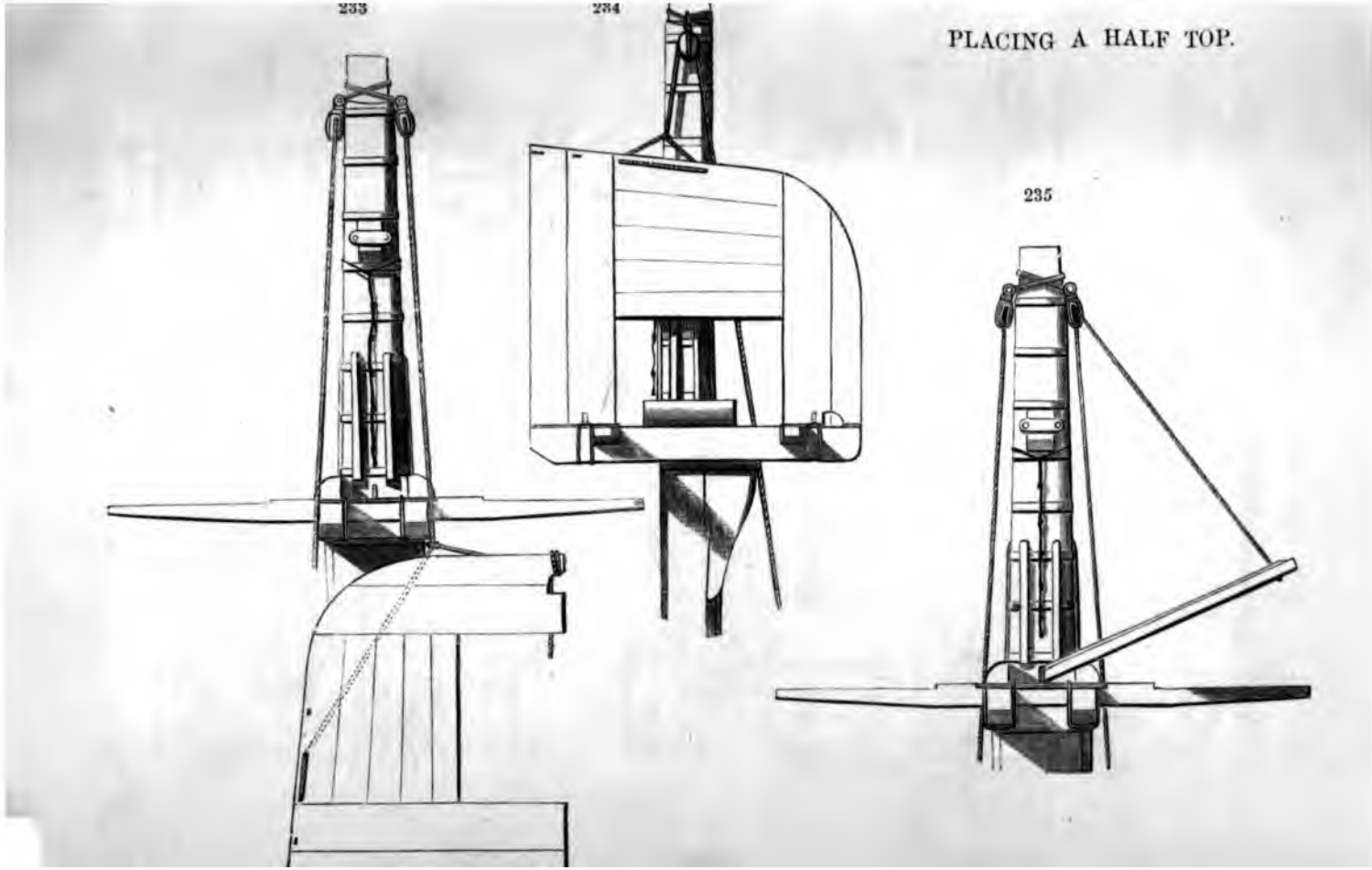


Sprung..... Signifies that a spar is strained, and that some of its fibres are broken.

Battledore..... A movable iron arm in the cable bitts of small vessels.

GETTING TOPS, &c., OVER MAST-HEAD.

How is a trestle-tree sent aloft?

One gantline is used—the trestle-tree is slung with a span, so as to hang square, and to keep the gantline clear of the midship part which is to land on the hounds of the mast.

When both trestle-trees are in their places, they are bolted together through the mast-head.

(A rope is clove hitched round the mast-head, for the men to steady themselves with whilst working aloft.)

(The tressle trees and bolsters are now usually bolted on before the mast is stopped).

How is a lower cross-tree placed?

One gantline is bent to the cross-tree on its own side, and is stopped to the opposite arm and amidships—"Sway away." When above the trestle-tree, cut the upper stop; it will then hang square. The men aloft place and bolt it down to the trestle-trees (Fig. 230).

How is a whole top sent aloft?

Both the gantline blocks are lashed to the mast-head as high as possible, and a strand passed over the mast-head under the strops of the blocks on each side, and knotted to keep them well up. The top is placed on the deck abaft the mast, resting on its edge; the upper part aft. Pass each gantline under the top, up through the after futtock hole, down through the lubber's hole, and up through the foremost futtock hole, securing the end to its own part in the lubber's hole with two half hitches. Secure an after gantline to two of the stanchion holes in the after part of the top, and stop all three gantlines to the fore part (Fig. 231). "Sway away." Guy off clear of the trestle-trees with the after gantline, and rest the top on the after horns; cast off the foremost stops, and when the men are clear, "Sway away" (Fig. 232), canting the top over the mast-head with the mizen gantline.

How is a whole top sent down?

The main gantlines are bent as before, but the after gantline is bent to the fore part of the top, through the hole for the slings of lower yard, and used for canting it over the mast-head. When clear of the mast-head, let it rest on the trestle-trees, stop all the gantlines to the fore part, then sway clear, and "Lower away."

The mizen-top is sent up and down on the fore side of the mast.

How is a half top sent aloft?

The half tops are placed flat on the deck on their respective sides abaft the mast. The gantline is sent down abaft the after cross-tree, and bent through the two most convenient futtock holes, in order that the half top may hang square whilst going aloft. An after gantline is bent to the after part, stopping it to the side. Lash two stout planks with spurs in them across the horns of the trestle-trees before and abaft the mast (Fig. 233). "Sway away." Guy clear of the trestle-trees with the after gantline. When high enough, bear the half top round into its place, letting the midship part take against the spurs placed between the trestle-trees (Figs. 234, 235). Lower away and place, unbend the gantlines, send the sleepers aloft, and bolt all down.

To remove the plank and spurs, the midship part must be wedged up.

How is a lower cap sent aloft?

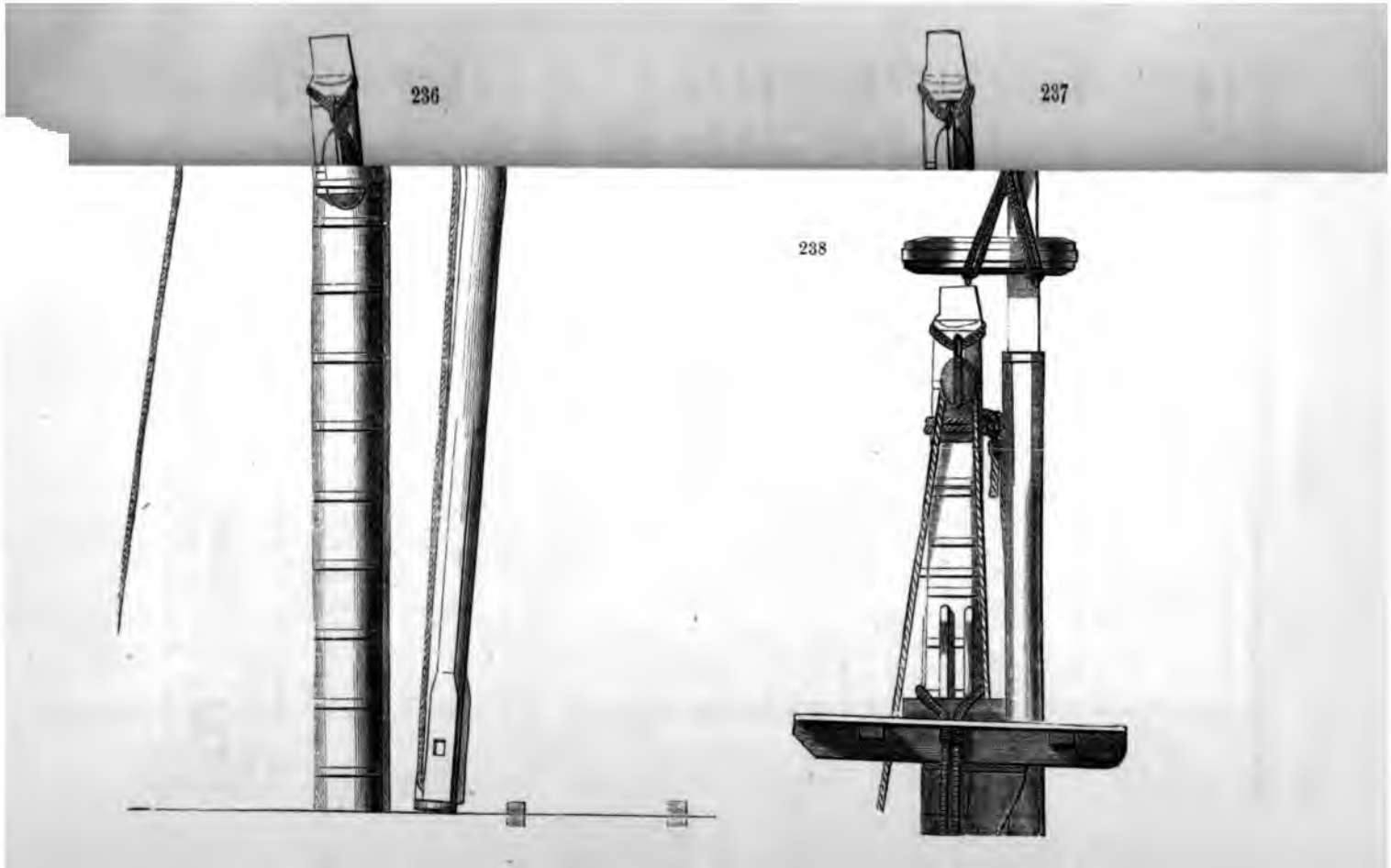
If landed in the top before the rigging is placed, it can be sent up through the lubber's hole.

The two gantlines secured on the same side of the mast are led down through the lubber's hole, and bent round the midship part of the cap, being stopped to the foremost edge. The cap is landed in the fore part of the top athwart ships, with the round hole ready for the topmast to point through.

If landed in the top after the rigging is placed, it must be sent up before the top rim, when a gantline from forward will be required to guy it clear, and it may either be landed as before, or hung with the square hole forward.

How is a topmast pointed?

The heel of the topmast should be aft, and the after part up. A top block is lashed to the lower mast-head, and a hawser rove in it from aft, forward, then through the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sheave in the topmast, and the end secured round the topmast head with a clove hitch.

NOTE.—The after part of the mast is known by the lightning conductor.

The hauling part of the hawser is racked to the standing part, and lashed to the topmast about one-third down; the two first turns of the lashing being taken round the mast to prevent its slipping down. A rope's end is secured to the head of the topmast. "Sway away." Guy the mast-head forward before the top rim with the rope's end (Fig. 236). When the heel is high enough, bear it into the hatchway, and lower away until the head of the topmast is low enough for pointing, then sway the mast up, and land the heel on the deck (Fig. 237). Cast off the racking, lashing, and the standing part of the hawser, and secure it to the lower mast-head.

How is the cap placed on the lower mast-head?

The top block is lashed to the lower mast-head, leaving room for placing the cap. The topmast is swayed up through the round hole of the cap which is in the fore part of the top, and is lashed square to the topmast head (Fig. 237). "Sway away." The cap is placed square on the mast-head, by slue ropes on the topmast (Figs. 237 and 238).

NOTE.—The lashing is middled and clove hitched round the topmast head, it is then passed on both ends—through the bolts and round the mast-head.

If the topmast is slued half round before lashing the cap, when the hawser is swayed on, the cap will come nearly square over the lower mast-head.

How are the topmast cross-trees sent aloft and placed?

The topmast is pointed through the lower cap, and the gantline blocks lashed to the topmast head. The gantlines are bent under the fore part of the trestle-trees. An after gantline is used to guy it clear. "Sway away." When the cross-trees are resting on the after part of the lower cap and against the topmast, lash the after horns of the trestle-trees to the lower cap (Figs. 239, 240), and lower the topmast, the cross-trees will then fall into their place.

How is a topmast cap placed?

Two gantline blocks are lashed as high as possible on the fore part of the topmast head; the gantlines coming down before all, are bent to the foremost lower bolts of the cap, and stopped to the after ones. A gantline from forward is bent to the foremost part of the cap, and stopped to the after part. The cap is sent up before all.

When the stops are touching the blocks, cut the stops, pull the gantlines close up carefully, the cap being placed by the men aloft.

How is a bowsprit cap got off or put on?

Rig a pair of sheers with two good studding-sail yards, stepping the lower ends against the fore-topmast stays. Use a sail tackle for a topping lift and a luff for a purchase: or it may be taken off with the jib-boom, the same as a lower cap is with a topmast, and sent inboard with the sail tackle.

The bowsprit cap is bolted in its place by a bolt driven up through the cap and the bowsprit, the end being forelocked on top of the bowsprit.

How is a jib-boom got out or in?

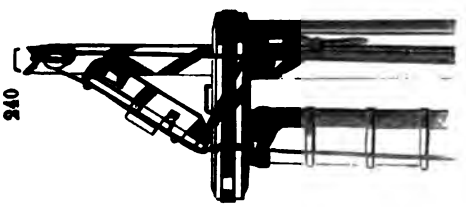
The heel rope is rove through a block hooked to the bowsprit cap, through the heel of the jib-boom, and secured to a bolt on the opposite side of the bowsprit cap. A jigger on the fore stay hooked to a strop on the jib-boom, is used to steady and point the head through the cap, shifting the strop along the boom as it goes out. When pointed, the jigger is taken off, and the jib or fore-topmast staysail halliards hooked to a strop on the head of the boom to support it as it goes out (Fig. 241). When far enough out, take a turn with the heel rope, pull up the jib or staysail halliards to get the heel of the boom down into the saddle. Pass the heel and crupper chains.

NOTE.—A ring bolt is frequently sunk into the head of the jib-boom for convenience in shifting.

How is a lower yard got in from alongside?

Bring it alongside with the opposite yard-arm forward. Rig a derrick with the jib-boom or mizen topmast, stepping it, and lashing the heel between the main bitts, or against the opposite waterway, taking two sail tackles for guys, an up and down for a topping lift, and a good luff for a martingale. Reeve a hawser through a leading block lashed to a mast-head pendant, through a top block lashed at the derrick head, through the after jear block on the yard (or another top block secured to the slings of the yard), and secure the end to the derrick head. Reeve three parts of the jears and use two top burtons for lower lifts (Fig. 242). Walk the yard up to the derrick head with the hawser, taking in the slack of the jears. A rope's end on the after yard-arm will keep

PLACING TOPMAST CROSSTREES.
GETTING JIBBOOM OUT.



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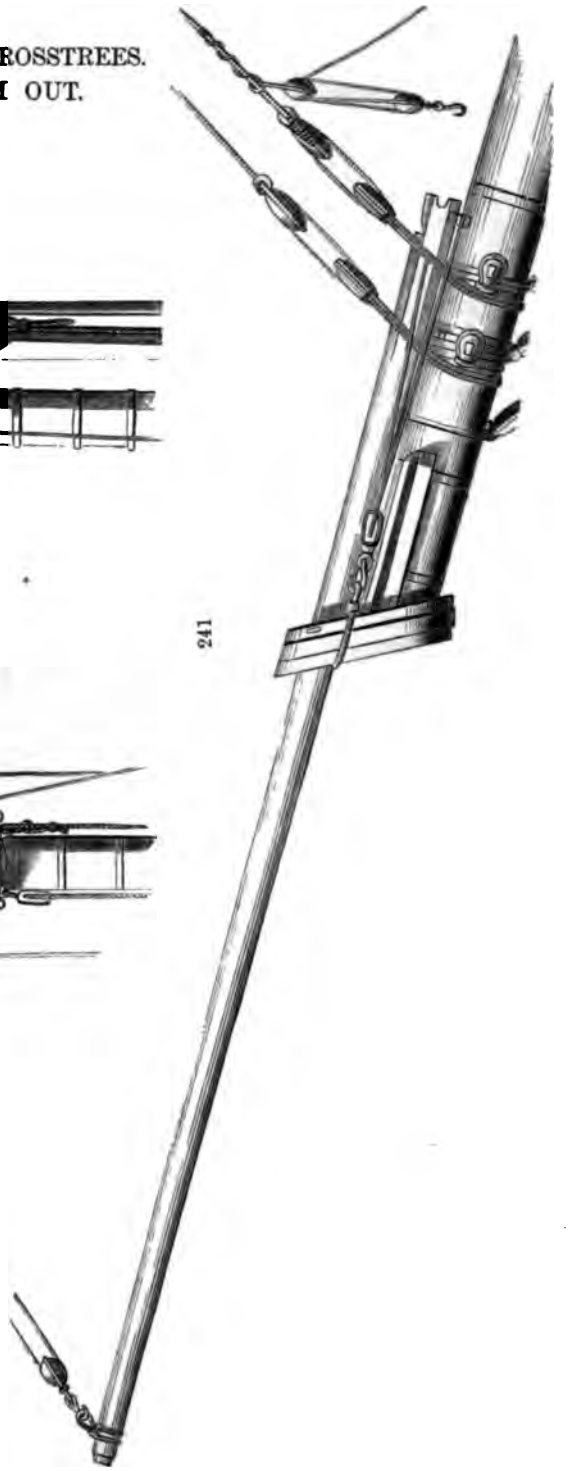

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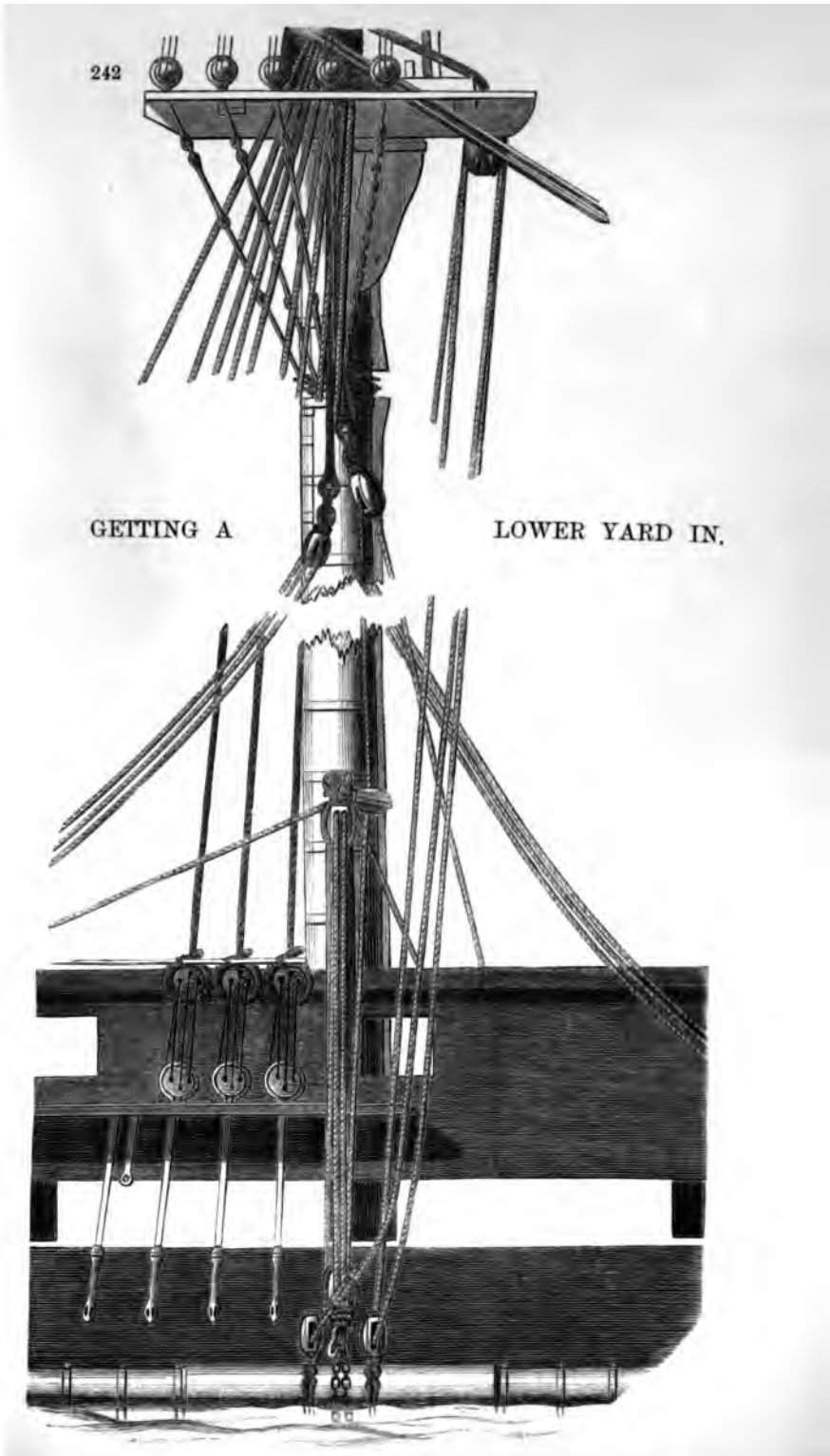
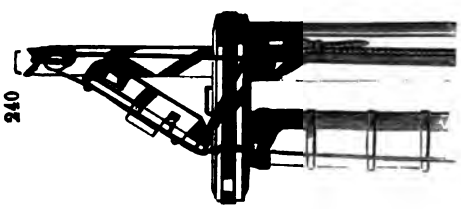


GETTING A LOWER YARD IN.

PLACING TOPMAST CROSSTREES.
GETTING JIBBOOM OUT.



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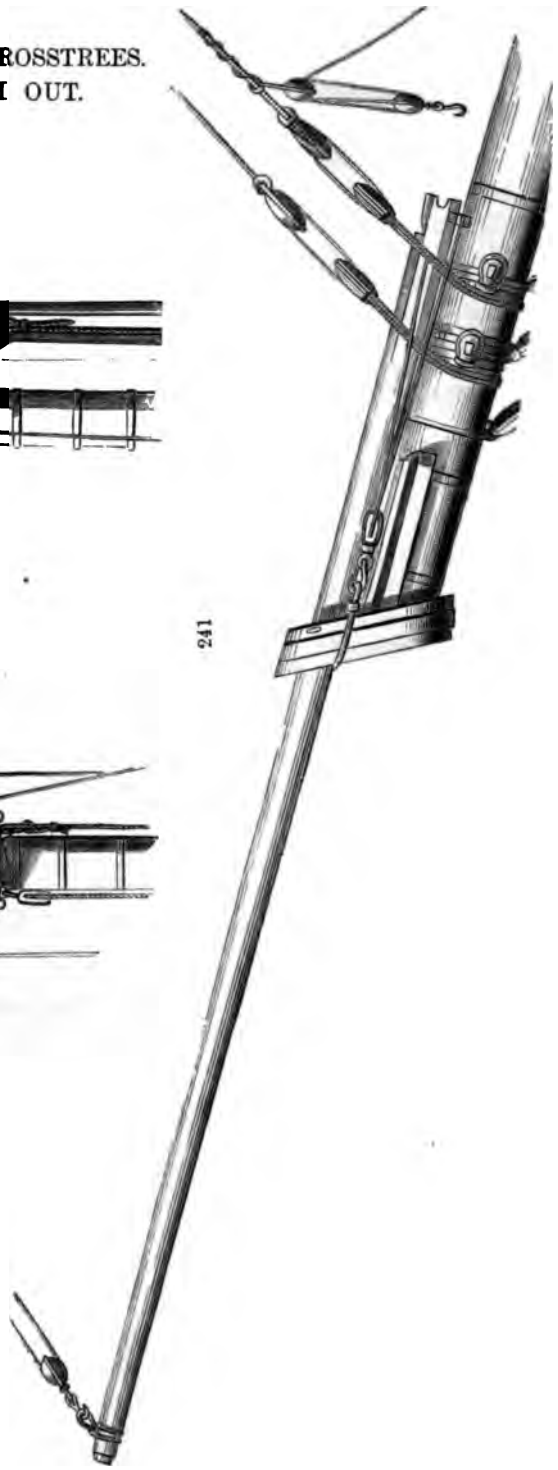

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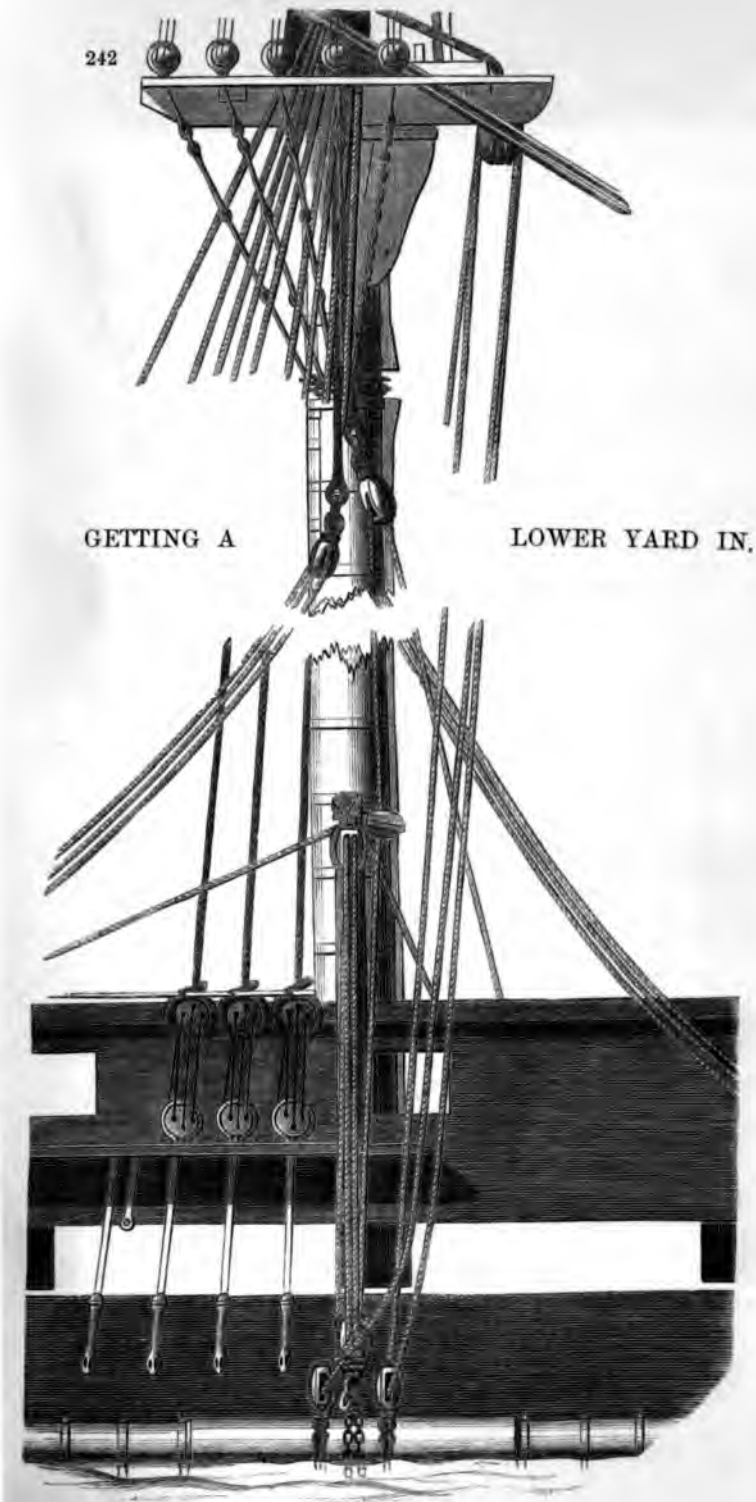
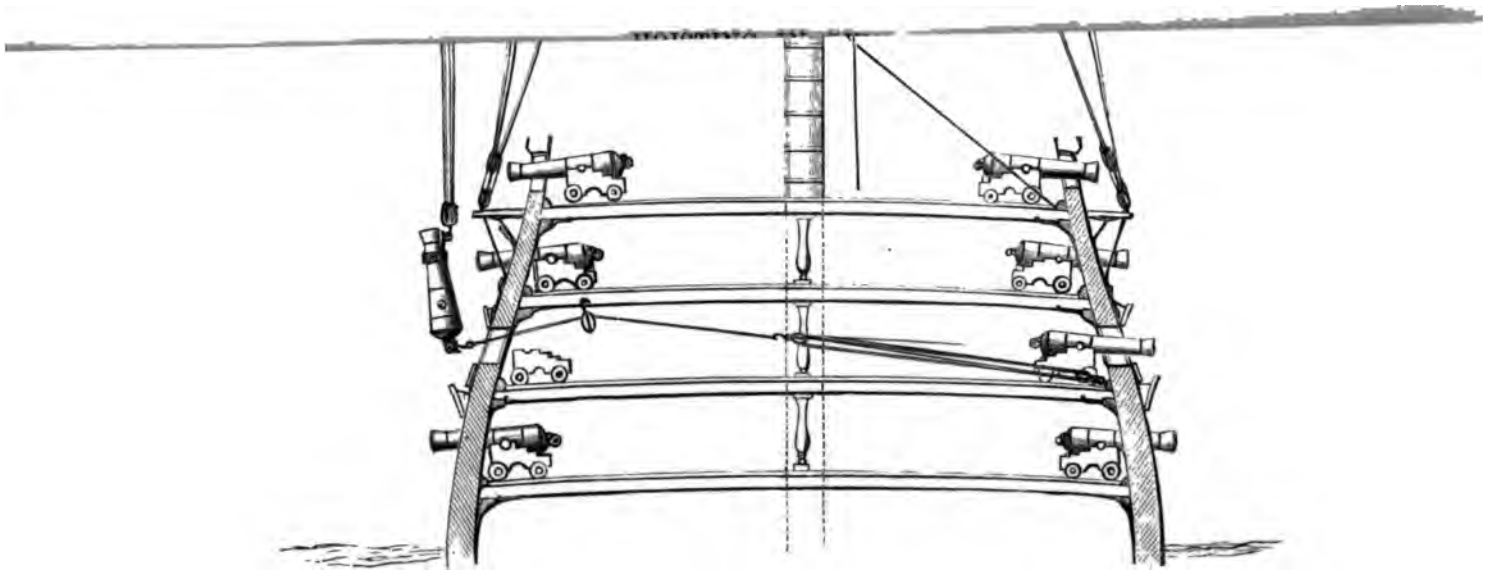


GETTING A LOWER YARD IN.



it close in to the ship's side, and the foremost yard-arm out clear of the anchor. When clear, haul on the foremost lift and the jears, ease away the hawser and land the yard in its place across the hammock nettings.

In some ships the fish davit with the usual gear will be sufficient for a derrick (Fig. 243). The further the derrick plumbs out the easier the yard will come in.

How are guns got in?

Top the main yard up and brace it forward immediately over the port through which the gun is to be taken in. Hook a luff tackle to the opposite rolling tackle strop, and a strop round the mast, and haul it well taut. Reeve the pointed end of a top-tackle pendant through a top block, up abaft the main yard, outside the top rim, over the lower cap, down through the lubber's hole and secure on deck round the bitts. Put a burton on the yard-arm for a preventer lift; lash an up and down tackle to the yard arm, and the lower block to the top block on the pendant for an outhaul. Reeve as many parts of the top-tackle fall as convenient for a purchase, hooking the upper block to the thimble of the top-tackle pendant, and leading the hauling part of the fall through a leading block on the strop of the upper block and one on the lower cap.

The gurnet is a pendant and tackle, worked upon the deck that the guns are coming in upon. The pendant reeves through a dismounting block hooked to a bolt in the beams, over the breach of the gun, or a hole is cut in the deck and the block is lashed to a toggle across the hole. The end of the pendant is fitted with a hook or shackle to take the neck ring of the gun (Fig. 244B).

The gun is slung with a long selvagee or chain strop, one bight having a seizing on it to form an eye large enough to take the button of the gun, the slings lead along the top of the gun and are well lashed to the muzzle, not too far out; the other bight is hooked to the purchase.

The gun is hoisted muzzle upwards just clear of the ship's side; when the neck ring is level with the port the gurnet is hooked and hauled upon, the purchase being lowered as the gun goes into the port. The gun is pulled close up to the beams, and when over the carriage lowered into its place (Fig. 244).

Upper deck guns—Are taken in over all. The up and down tackle is reversed to gain a better purchase, the double

block being hooked to the top block on the pendant, and the single block lashed to the yard-arm. The fall is led through good leading blocks at the yard-arm and lower cap, and eased in when the gun is high enough above the hammock netting.

The gurnet is worked as a stay tackle.

NOTE.—The top tackle pendant should be well protected with mats, &c.

The top-tackle pendant, or a hawser taken to the topmast head, brings less strain on the mast and yard. 6¼-inch topmast rigging is more than equal to hoisting in a weight of 20 tons if the yard is topped up and secured in the bunt.

How is a launch hoisted in? (Fig. 245).

The tackles used are the fore and main yard and stay tackles. The yard tackles are kept on the yards; the stay tackles amidships ready for tricing up.

"*Away aloft*," get burtons ready out of the tops, fore yard whip for preventer brace. Stay whips overhauled down. Man the lower lifts.

"*Top away*," "*lay out*." Top the yards as required, haul taut burtons, topsail sheets, trusses, and opposite lifts.

"*Tricing lines and braces*."—"*Trice up*," "*Brace in*."

The fore yard is braced well in, and having so much fore and aft strain a preventer brace is put on, taken to the bowsprit, and hauled taut.

The main yard is braced aft so as to bring the boat in clear of the fore rigging, the more the yards are over the boat the less strain there is on the tackles. (If the fore-yard is hauled in too far the boat will touch the sheet anchor.) Haul taut the trusses and the opposite lifts.

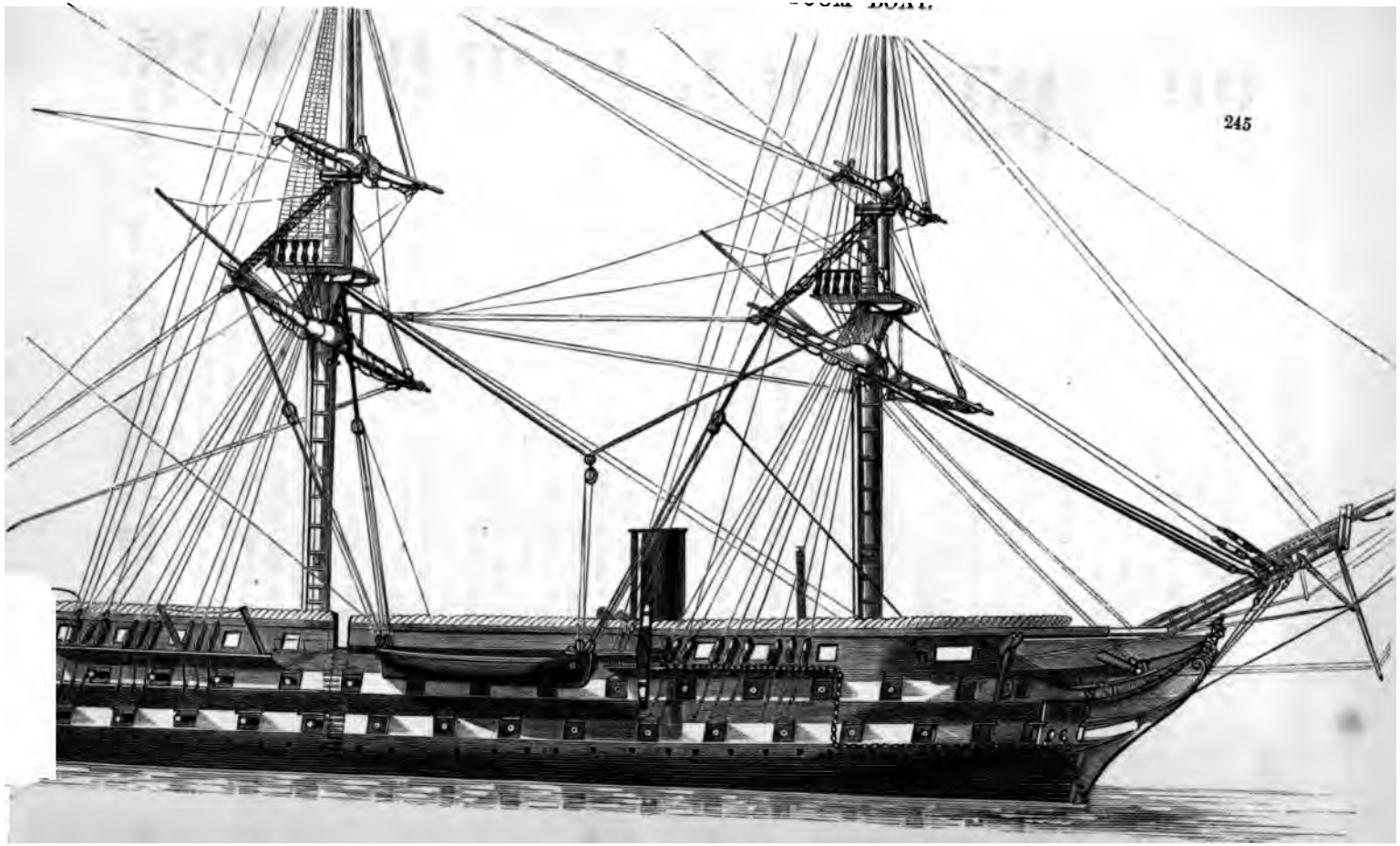
Trice up the pendants of the stay tackles and lower the bill and quarter tricing lines of the yard tackles. Hook the lower blocks to the slings of the boat.

In hoisting in, the fall of the fore-yard tackle is led on the same side of the deck as the boat is coming in, and the stay tackle on the opposite side.

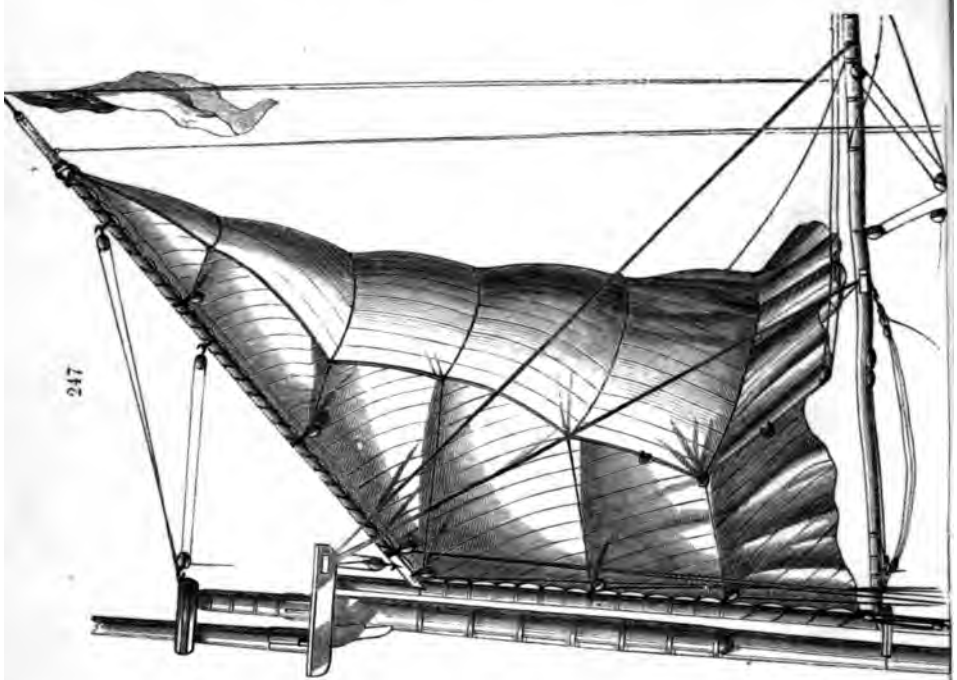
In hoisting out it is led *vice versâ*, to prevent the men being under the boat as it passes under the gangway.

"Away with the yards," taking in the slack of the stays.

The higher the boat is hoisted, the more strain is brought on the yard tackles and yards. When high enough, "Turn with the yards," "Man the stays," "Away with



BRAILING UP A SPANKER.



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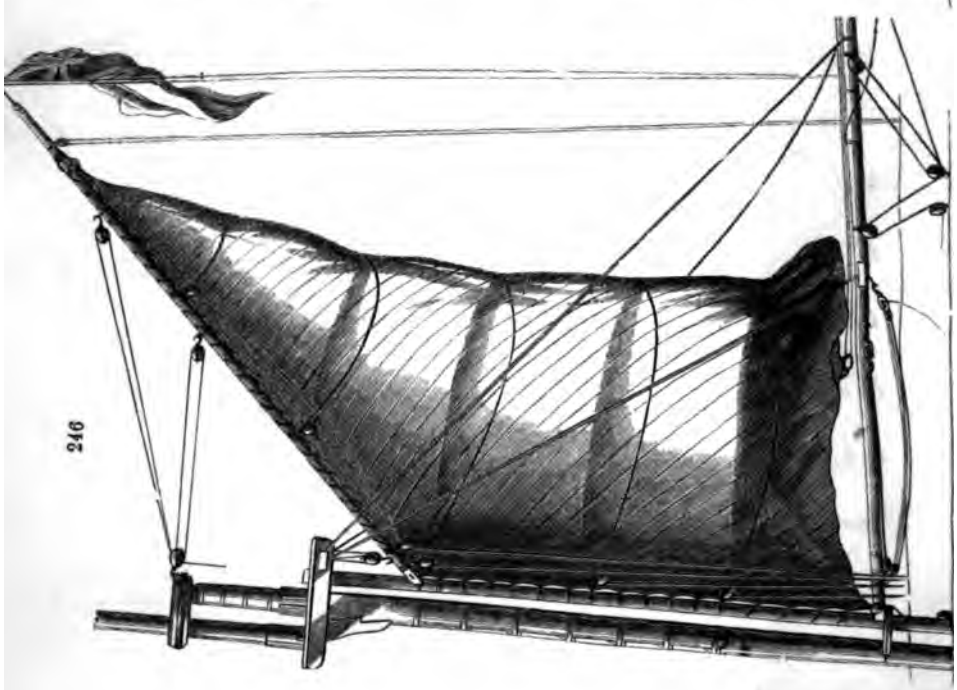

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the stays," "Ease away the yards," "Turn with the stays," "*Lower of all.*"

Luff tackles on the opposite main rigging and sheet anchor stock will pull the boat over into its place, "Lower the stays."

If the main yard and fore stay is worked on one side of the deck and the fore yard and the main stay on the other side, the men from the main yard can man the fore stay and those from the fore yard the main stay.

If the boat touches the fore rigging, a luff tackle led from the boat to the main rigging will haul it aft clear.

When the boat is placed "*Square yards,*" "*trice up and lower away*" the yard and stay tackles.

If the fore yard is obliged to be braced in, both launches must be hoisted out and in on the same side. In short ships if the yards can be left square the boats may be hoisted out one on each side at the same time, but it brings great strain on the yards.

EXAMPLES IN MANAGING SAILS.

In taking in a sail, the more it is turned into a balloon the more difficult it is to manage.

With the *lee sheet* let go, a sail will be emptied of wind, but if blowing hard enough it will shake itself to pieces.

With the *weather sheet* let go, the wind remains in the sail, but keeps it steady.

If a studding-sail tack requires to be hauled out, the wind is made to help by keeping the ship away.

In hauling out a spanker outhaul, the wind is made to help by easing the boom well over on the quarter.

In a boat if the sheet is required to be hauled aft, the wind is made to help by luffing the boat.

In taking in a spanker or trysail, the wind is got out of the sail by hauling up the lee brails first (Figs. 246, 247).

NOTE.—Take care that the sail does not get over the lee cross-jack yard-arm; to prevent it doing so, the yard must sometimes be braced in.

In taking in a top-gallant sail or royal, the wind is got out of the sail by letting go the lee sheet first.

To get a yard down. Let go the lee sheet, haul in upon the weather brace, and haul down upon the clewlines, keeping the weather sheet fast.

In taking in a jib. By letting go the halliards, the wind is got out of the upper part of the sail, and it runs two-thirds down the stay of itself, then by starting the sheet the sail is hauled down without straining the stay or boom.

In furling a jib, the wind is got out of the sail by letting go the sheet and gathering the foot of the sail on the boom passing it along from the tack.

Lowering a sail in a boat, the wind is got out of the sail by letting go the sheet, and hauling down by the luff or foremost leech, on the weather side of the boat.

In a boat caught in a squall, the wind is got out of the sail by letting go the fore sheet and luffing the boat up into the wind.

In taking in a course, the wind is got out of the sail by hauling up the buntlines and leechlines more than the clewgarnets.

In taking in a course, or a topsail blowing hard, such large sails will not stand being shaken, therefore the wind is kept out only as much as prudent, and the sail taken in by starting the lee sheet *a little*, hauling up the weather gear first, and then the lee gear. If it is required to relieve the ship quickly, the lee sheet must be let go even at the expense of the sail.

NOTE.—In taking in a course blowing hard, the chief danger is that when the tack is let go, the lower yard-arm having lost its downward support is sprung by the great strain of the topsail sheet buckling it upwards. The yard should therefore be properly secured, and particularly so before taking the sail in.

"'Man the clewgarnets!' 'Let the main-sheet fly!'
It rends in thousand shivering shreds on high!
The mainsail, all in streaming ruins tore,
Loud fluttering, imitates the thunder's roar.

. . . . .

The watchful seaman, whose sagacious eye
On sure experience may with truth rely;
Who from the reigning cause fortells th' effect,
This barb'rous practice ever will reject;
For fluttering loose in air, the rigid sail
Soon flits to ruins in the furious gale;
AND HE, WHO STRIVES THE TEMPEST TO DISARM,
WILL NEVER FIRST EMBRAIL THE LEE YARD-ARM."

FALCONER'S *Shipwreck*.

MAKING UP AND BENDING SAILS.

How are all square sails bent to the yards?

With head earings (Fig. 248) and robands (Fig. 20). The head earings are secured to the strop at each yard-arm, and the robands hitched to the jackstay on the yard with a roband hitch.

How are the earings fitted?

The head earing is spliced into the head cringle of the sail with a long eye (Fig. 248). The 1st and 2d reef earings are rove with a long running-eye round the yard-arm (Fig. 253).

The 3rd and 4th reef earings are spliced into the lower reef cringle eyelet-hole, and the end of each is made fast to the cringle above it with a bowline knot (Fig. 249).

How is a reef becket fitted round the yard?

It is longer than the round of the yard, with a toggle in one end, and two worked eyes in the other; it is rove round the yard, the toggle being passed up the fore side, under the jackstay, and through the first eye. In reefing, the end of the becket is passed under the reef line (Fig. 252), and then toggled (Fig. 251).

The beckets are placed in pairs on the yard—one being used for the 1st and 3rd reefs, and the other for the 2nd and 4th reefs.

How is a head earing passed?

It is spliced into the head cringle of the sail with a long eye. A turn taken down through the head earing strop, and up through the head cringle in the sail. The sail is middled and hauled taut out and well on top of the yard, one turn is then passed round the jackstay and up through the cringle, then three or four turns round the yard and up through the cringle, the end being hitched round all parts under the jackstay (Fig. 248).

Which side of a sail is bent to the yard?

A square sail is always roped on the after side, therefore always bend with the roping between the sail and the yard, otherwise the stitches would be chafed (Fig. 248).

Is a top-gallant sail or royal bent to the yard whilst on deck or aloft?

They are bent to the yards whilst on deck.

In bending and unbending a topsail, what ropes are bent and unbent from the sail?

Sheets, clewlines, reeftackles, bowlines, and buntlines.

What rope is used for sending the sail aloft?

The sail tackle hooked round the topmast head, and to the strop in the bunt of the sail.

In unbending a topsail what ropes are used to lower the sail?

The buntlines—the bunt robands having been stopped to them; or if sent down furled, hitch the buntlines round the sail. At sea the sail tackle must be used.

Explain the fittings of the buntline toggles, and how the buntlines are bent.

The buntline toggles are stropped round the foot rope of the sail into an eyelet-hole on each side of the bunt; the buntlines are fitted with a running-eye, and put over the toggles.

Explain the fittings of the reeftackle pendant, and how the reeftackles are bent.

The pendant is spliced into a cringle just below the 4th reef cringle, passed down through the thimble in the reeftackle block strop, and hitched to the upper bowline cringle (Fig. 249).

Explain the fittings of the bowline bridles.

There are three bridles to the main (Fig. 250), and two to the fore and mizen topsails (Fig. 249).

The bridles are spliced into cringles on the leech of the sail, one bridle working on the other; the toggle is stropped round the lower bridle for the fore and mizen, and centre one for the main topsail.

Why has the main topsail more bowline bridles than the fore?

Because the fore top-bowline leading down to the bowsprit will not tauten more than two bridles (Fig. 249), the main top-bowline leading nearly horizontally across to the fore top will tauten three or more (Fig. 250).

How are the sheets bent?

The topsail sheet block, fitted with a single strop and a thimble, is shackled to the clew (Fig. 210), or the block is stropped into the clew (Fig. 211).

The latter brings the strains better on the block. If the sheet block were fitted with a double strop, the first plan would be better than at present.

FITTINGS OF A TOPSAIL.

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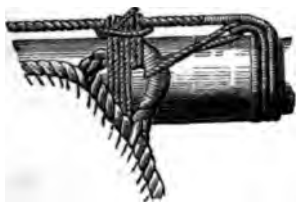

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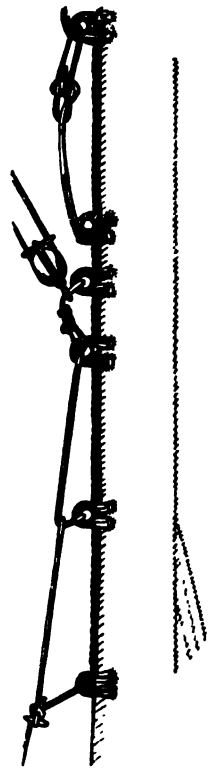

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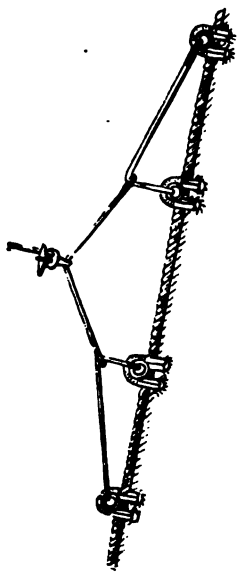

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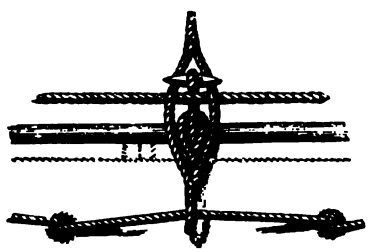

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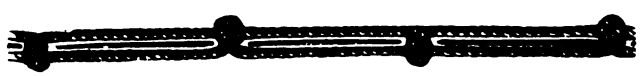

How are the clewlines bent?

The clewline block is fitted with a single strop and two legs, which are knotted or lashed together round the clew of the sail (Fig. 211).

How is a topsail made up furled for bending?

Stretch the head of the sail taut along the deck, the after side down, gather the slack sail over towards the foot.

Carry up the 2d reef band close to the head of the sail and lay it on top of it, then pass in the leech as in furling on the yard.

See the 1st and 2d reef earing cringles and the 2d reef tackle cringle clear outside the leech rope at the yard-arms, the reeftackle pendants and bowline bridles out above the head of the sail.

Carry up the foot laying it on top of the bunt with the buntline toggles out above the head.

Leave the clews out well beyond the head.

Furl the sail as if it was on the yard, pass the gaskets, which should be sewn to the sail.

Hang the clews about a fathom up to a good roband to prevent their being pulled out of the sail, then bend the clew itself back down under the sail stopping it to the head.

The sail tackle or bending strop is secured to the head of the sail on the after part as a fixture; pass the other bight round under the sail, and up the fore side, seizing it to the after bight as taut as possible.

Large topsails require good quarter strops in addition to keep the bunt snug whilst sending the sail up or down.

If furling the sail to bend in bad weather, the reefs are taken in on deck, leaving the earings out.

To make up a topsail for bending without being furled.

Spread the head of the sail straight along on the deck, the after side down, gather all the slack sail over towards the foot.

See all robands and gaskets out, the 3rd and 4th reef earings clear and made fast with a bowline knot to the reef cringles above them.

Carry the third reef band close up to the head of the sail, and lay it on top of it, placing the leech rope inside the leech rope of the first reef; do the same with the belly band, and then the foot.

Draw the clews in towards the bunt as far as the reeftackle

pendants, which are left out at the end, will allow, then bring them out again square with the leech.

See the buntline toggles out at the head of the sail; the clews, reeftackle pendants, and bowline toggles, clear at each end.

Roll up taut towards the head and put on spunyarn stops, passing the head earings on the bight, and leaving the ends of them as close to the bunt as possible.

Put a strop on in the bunt, lashing the foremost bight to the two parts of the after one with spunyarn, so that it may be cut without injuring the strop (Fig. 298); or the foremost bight is taken round the two parts of the after one, and stopped to its own part.

(With the present mode of reefing, the furling gaskets should be secured on the sail, and if stitched on will always be passed square, and without wrinkles.)

What gear is bent to a course?

Tacks, sheets, clewgarnets, reeftackles, buntlines, leechlines, and slablines.

NOTE.—A fore course has also bowlines.

How is each bent?

The tack, sheet, and clewgarnet blocks are each fitted with a thimble in the block strop, a large shackle is used at each clew to shackle them in their places (Fig. 212).

The buntline toggles are fitted with a double strop round the footrope, and two seizings between the sail and the toggle (Fig. 217).

The reeftackles hook to the reeftackle cringles, with clasp hooks (Fig. 175).

The leechline and slabline toggles are fitted to the bowline cringles on the leech of the sail, in the same way as the buntline toggles, or with single strops. The buntlines and leechlines are on the fore side of the sail, and the slablines are abaft it.

How is a course made up for bending, keeping the sail furled?

Stretch the head of the sail taut along the deck, the after side down; gather all the slack sail over towards the foot. Stop the first reef cringles to the head earing cringles; pass in the leech leaving the leechline and slabline cringles out at the head; carry the footrope up to the bunt, leaving the buntline toggles out clear at the head, and the clews about a fathom out beyond the sail; furl as if the sail was on the yard; pass the gaskets,

which should be sewn to the sail; secure the stay tackle strop to the head of the sail on the after side; pass the other bight round under the sail up the fore side, and seize it taut to the after bight, which is the part to which the stay tackle should be hooked; secure the clews to a quarter roband, then bend the ends back down under the sail, and stop the thimble to the head. Large sails also require good quarter strops to keep the bunt snug whilst the sail is being sent up or down.

How is a fore and aft sail made up for stowing away?

Stretch the afterleech straight along the deck. Double the head clew and tack over towards the sheet, making nearly a square—then roll up towards the afterleech.

How is a jib made up for bending?

Stretch the foot of the sail along the deck. Coil the lacing down (which is stopped to each eyelet-hole) right-handed if the jib-stay is right-handed, ready for the stay to reeve. Stop all parts of the lacing together with spun-yarn, and secure the tack lashing or the bight of the halliards round all parts of the luff of the sail. Stop the sail up on the foot.

How is a jib bent to the stay?

The jib stay is unrove, brought in on the forecastle, rove through a grummet formed in the upper eyelet-hole of the sail, and all parts of the jib lacing, then rove in its place again by means of a reeving line; the jib is hauled out by the halliards and downhaul, and eased out by a rope made fast round the clew, which are bent to the sail on the forecastle. When out, the tacklashing is passed round the boom end, and the sheets lashed to the clew.

(The tacklashing is sometimes fitted with a strop and toggle.)

How is a topmast staysail bent?

To hanks running on the port topmast stay (Fig. 225).

Why has the jib a lacing and the staysail hanks?

The jib stay can be rove through the parts of the jib lacing on the forecastle, but the staysail must be taken out to the topmast stay, which cannot be let go like the jib stay.

How are gaff sails bent?

The head of the sail is shackled to a bolt under the jaws of the gaff, and the head earing hauled out towards the peak. The sail is then laced to the starboard side of the

gaff with roundabout turns, and bent to the trysail mast with a lacing or hoops.

What difference is there in securing the tack of a trysail and that of a spanker?

In a trysail the tack is secured with a tack lashing. In a spanker the tack is fitted to trice up, and has a tack tackle to secure it when down.

How are studding sails bent?

The earings are hauled out through holes bored in the yard-arms, and the sail is then laced to the yard with hitching turns. If the studding sails are kept unbent, a ready way is to work a grummet in one of the head clews, which is put over one yard-arm with cleats nailed on it; the other end is hauled out with an earing; the sail is then secured to the yard with tyers.

How are boats' sails bent to the yards?

All fore and aft sails are roped on the port side, therefore the sails must be bent to the starboard side of the yards. In bending never stretch the head of a new sail, but bend it slack to the yard.

If possible, always make a boat's sail up on the foot; when made up on the head, the sail gets worn more at the top, and consequently stretches, spoiling the look of the sail.

TO BEND SAILS.

Overhaul top-gallant and royal lifts and braces; trice up sail tackles for topsails, and stay tackles for courses; trice up booms; clear away earings and reeftackles on the topsail yards; overhaul the clewlines, buntlines, and bowlines.

On the lower yards, let down the earings and lower reef tackles; clear away and overhaul clewgarnets, buntlines, leechlines, and slablines.

Rack the jib and flying-jib halliards to their stays; clear away the purchases in the head; pull the halliards well up to overhaul the stays; then lower on to the forecastle; bend the jibs ready for hauling out.

The sail tackles are hooked to the after bights of the strops on the bunts of the topsails and courses.

The lower reef tackles are hooked to the first reef cringles

which are stopped to the head earing cringles. Hitch the leechlines round the sail exactly opposite where the blocks are secured on the yard.

Haul the top-gallant and royal yard ropes well forward, clear of the sails going up.

"Man the sail tackles;" "sway away."

The topsail is swayed up until the yard-arms are in the tops; then lowered until the bunt is a little above the yard.

Bend the topsail reef tackles stopping the hauling part to the head earing cringle.

The courses are swayed up and down until the bunt is above the yard.

Man the reef tackles of topsails and courses, lower leechlines, jib and flying-jib halliards, and outhauls.

"Lay out;" "haul out."

The topsails and courses are hauled out as taut as possible along the yards, the bunts being lowered as requisite.

Pass the head earings and robands; bend the gear, and cut the lashings of the bunt strops.

Refurl the sails, or let them fall as ordered.

Set up the jib and flying-jib stays.

Cross the top-gallant and royal yards, and sway up the spanker gaff.

The gear of the courses may be bent either before or after sending the sail aloft, but time is gained if it is bent before the sail leaves the deck; then hitch the buntlines round the quarters of the sail, not too far out, to help the sail tackle in the bunt, and man the clewgarnets well to prevent the weight of the tacks and sheets from hauling the clews out of the bunt of the sail.

NOTE.—Topsails and courses have sometimes a cringle worked in on the leech, between the head and first reef; that in the former also being fitted with a toggle; they are called bending cringles, and the reef-tackles are bent to them, on the topsail with a running eye over the toggle, and on the course the reef-tackles are hooked. When the head earings are secured the reef-tackles are shifted to their proper places.

REEFING SAILS.

How is a topsail reefed?

As soon as the men are on the yard, the sail is gathered up hand over hand until each man has hold of the reef line, then all facing to leeward light the sail out to windward

together. When the weather earing is passed, face to windward, and light the sail out to leeward; when the lee earing is passed, toggle the reef beckets, and lay in.

NOTE.—It is a good plan to have reef-points fitted in the sail at the yard-arms, one for 2nd reef, two for 3rd, and three for the 4th, for after the 1st reef the sail is hauled up outside the topsail lifts where there are no beckets, therefore a great strain is brought on the reef earings and outer reef beckets.

How is a reef shaken out?

The reeftackles are hauled well taut, and the halliards lowered a little in order to take the strain off the earings. The reef beckets are first untoggled, working from the bunt towards the yard-arms, and after they are all clear the earings are eased down.

How are the first and second reef earings passed?

They are each rove with a long running eye round the yard-arm, passed from aft forward through the reef cringles, and the sail hauled well up on top of the yard. then three turns round the yard up through the cringle, and the end hitched to the lift (Fig. 253).

If the first inner turn is taken round the yard without being passed through the cringle, the sail will keep up better, and the earing is passed much quicker (Fig. 254).

How are the third and fourth reef earings passed?

They are each spliced into the lowest eyelet-hole of the reef cringle with long eyes. A turn is taken round the yard-arm, before the lift, over the cleats, and through the reef cringle from aft forward. The sail is hauled well up on top of the yard, then three or four turns passed round the yard and up through the cringle. The end, after taking a turn round the yard-arm, is hitched to the lift.

If the first inner turn is passed round the yard-arm only, it will keep up better (Fig. 255).

For smartness, earings are frequently passed on the bight.

(The general way of passing the third and fourth reef earings cannot be good, as if sufficient strain comes on the sail they always come down. A strop round the yard-arm, with a large thimble covered with hide, is sometimes used, and the outer turns of the earings are passed the same as a head earing. Fig. 256.)

When reefing in bad weather, if the slack sail is left hanging down abaft the topsail, it will chafe against the sail; to prevent it slab reef lines may be fitted as follows: for the first reef splice points of nine or twelve thread stuff into the head of the sail, three or four on each side, reave them from abaft, forward through small eyelet-

PASSING A REEF EARING.

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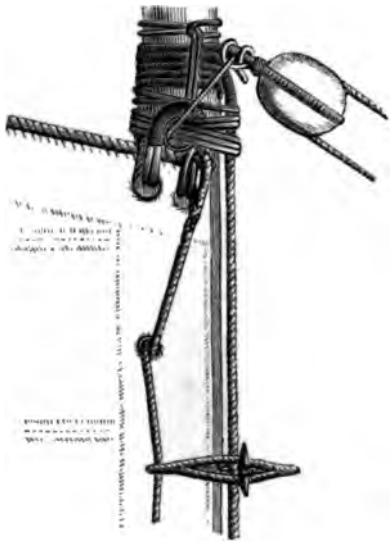

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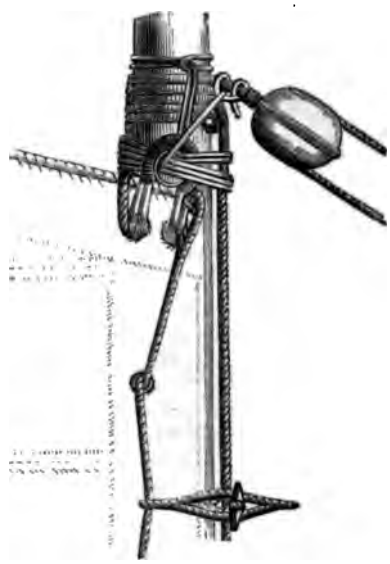

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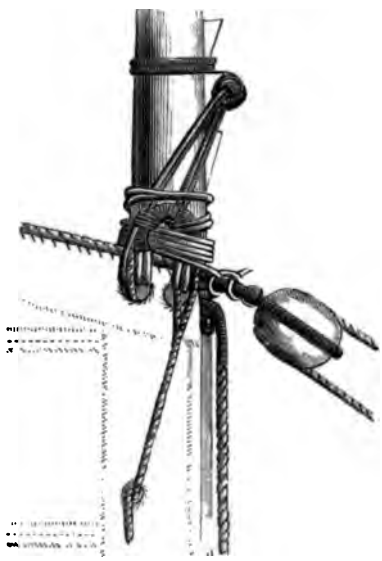


255

holes worked in the sail below the jackstay of first reef, and make a knot in the end to prevent them unreaving; for the other reefs the points must be spliced round the jackstay of reef above, and rove as before. When the reef is taken in, haul taut the points before the sail, and hitch them to the jackstay, or toggle of reef becket; the slab will then be quite snug abaft the yard. If these lines are not fitted, stop the slack sail up with spunyarn, or in reefing gather the slack sail up between the yard and the sail before toggling the reef beckets.

How is a course reefed?

The clewgarnets and buntlines must be raised or the sail taken in altogether, the reeftackles hauled close out, slacking the gear if necessary. Pass the earings the same as with a topsail; but the points having only one leg are hitched to the jackstay with a roband hitch, or in pairs.

Too many inner turns of the earing cannot be passed, as it has to bear the whole strain of the tack being hauled down.

How is a spanker reefed?

See both boom sheets taut. If the clew of the sail is shackled to the boom end and the sail fitted with reef pendants, hook the reef tackle which is kept under the boom to the pendant, settle the peak and throat halliards, hauling on the reeftackle as the after leech slacks. Belay the reef-tackle to the cleat under the boom, tie away the points. Shift up the tack tricing line and tack tackle. Pull up the throat and peak halliards, and reset the sail.

If the second reef is to be taken in, the first reef pendant is stoppered and hitched round the boom, and the reeftackle put on the second reef pendant.

If the sail is fitted with brails, brail the sail up. Lower the gaff sufficiently, taking in the slack of the peak and throat brails. When the reef points are tied and the outhaul is shifted, haul it out to see that the reef is taken in properly, and brail up again. Pull up the throat and peak halliards attending the brails. When high enough haul out the outhaul.

FURLING SAILS.

Explain how to furl a topsail?

The buntlines are hauled well up above the yard—haul out the second reef earings level with the head earings; pass in the leech from the yard-arms; gather the foot of the sail on top of the yard in the bunt, leaving both clews hanging down before all as slack as possible; gather up the skin, shaking the slack sail well down into it, and working it in between the clews and the yard towards the bunt on both sides; pass the gaskets and clew hangers, taking care that the skin covers all the slack sail as taut as possible.

A bunt jigger is used to assist in furling a topsail, and a bunt whip in furling a course.

In furling a lighter square sail, the leech is passed taut in from the yard-arms at once.

How is a jib stowed?

Gather the foot on to the boom for a skin, leaving the slack sail at the boom end taut from the after clew, which is close to the bowsprit cap; then gather up and pass the stops.

How is a spanker furled?

With the gaff lowered close to the boom, the vangs are hauled taut (if foul of the topping lift, secure the gaff with a rope's end) and the boom manned on one side. Pick up about four feet of the head of the sail on the same side of the gaff as the men are, and place it on the gaff for a skin, haul the bight of the after leech and the slack sail taut forward; then lean over the gaff and "pick up," easing the skin down. Pass the gaskets. If carefully furled, a good skin may be formed with the foot of the sail.

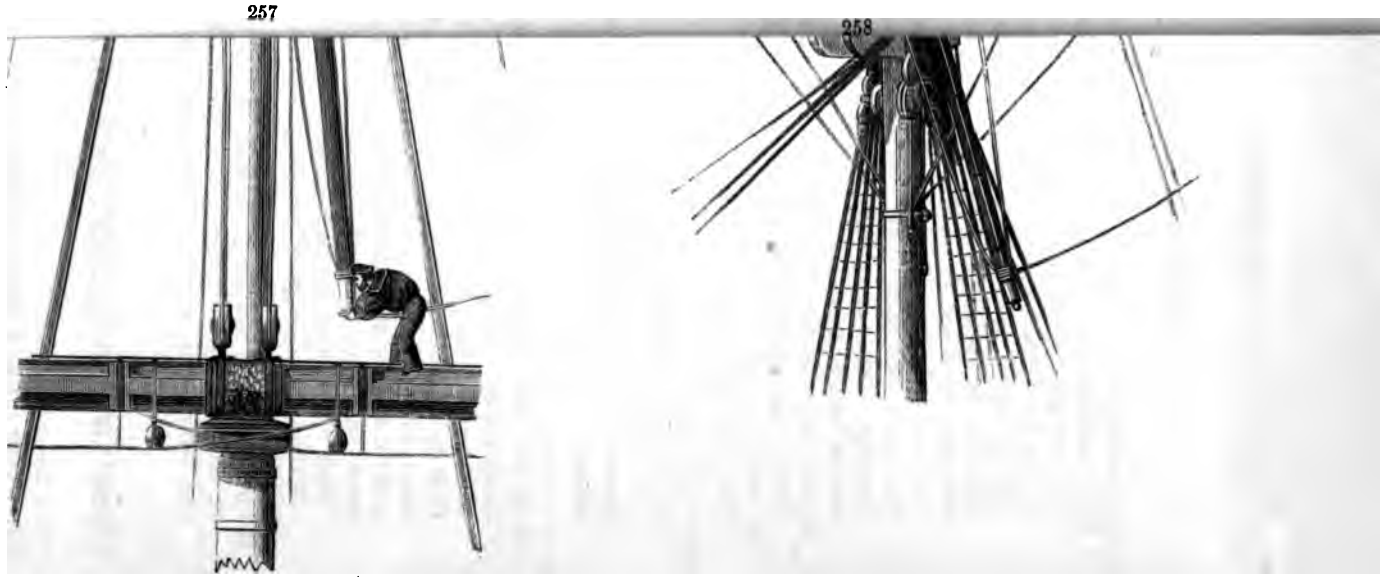
If furled without lowering the gaff, haul the brails close up on the lee (or one) side, take in the slack of the others, and form a skin with the after cloth. Pass the gaskets.

CROSSING TOP-GALLANT AND ROYAL YARDS.

To cross a top-gallant yard.

The upper lift and brace are slacked sufficiently to be put on the yard-arm by a man standing on the topmast cross-

CROSSING A TOP GALLANT YARD.



trees or cap. The lower lift and brace are overhauled down sufficiently to be put on by a man standing on the quarter of the topsail yard. "Sway away" the yard.

When "high enough" for rigging, the grummet which confines the yard rope to the yard is taken off the upper yard-arm, and the yard-arms rigged (Fig. 257).

If the sail is to be set the lifts are stopped to the jackstay. "Down lower lift." "Sway away."

The yard is either swayed high enough for crossing with a lizard, which is attended by a man standing on the topmast cap; or the upper yard-arm is left leaning on the topmast stay; or the yard is crossed at once. "Sway across" (Fig. 258).

The yard is then parreled and squared by the braces and lifts.

(If an extra man is stationed in the bunt of the topsail yard, to carry the lower yard-arm a little way out on the topsail yard and steady it there, it ensures the upper yard-arm canting properly, and that both yard-arms are rigged clear. The upper yard-arm should always cant abaft the yard rope.)

In getting ready for crossing a yard, when are you sure that the lower lift is overhauled down clear?

When it touches the yard rope all the way up and down (Fig. 257).

Which is put on first, lift or brace?

Brace.

In sending yards down at sea, which side is the yard-rope stopped out?

The lee side.

Which side does the yard come down?

The weather side, and through the lubber's hole; in sending the royal yard down, a weather top-gallant backstay is used for a traveller.

If a yard-arm is rigged foul, how is it cleared after the yard is crossed?

Stop the yard-rope out for a preventer lift and secure the yard to the shroud, then unrig the yard-arm and rig it afresh.

After crossing top-gallant yards, how is the gear bent?

The clewlines, fitted with worked eyes, are rove through the foremost sheave of the quarter block and toggled or bent to the clew of the sail (Figs. 208, 209).

The sheets, fitted with worked or spliced eyes, are toggled to the clew of the sail. The topgallant halliard purchase

is put on the yard-rope (Fig. 213), and the tripping line unbent and coiled up on the crosstrees.

If the royal yard is crossed, the royal sheets are rove through the after sheave of the top-gallant quarter block, up through the sheave or snatch cheek in the top-gallant yard-arm, and toggled or bent to the clew of the royal.

Royal clewlines and halliards the same as top-gallant sail.

(Quarter blocks are sometimes fitted to hook to and unhook from a bolt driven through the quarter of the yard. They hang lower than if fitted in the usual way, but do not get knocked to pieces or hang the yard as it is sent down.)

How is a top-gallaut yard sent down?

The yard-rope is stopped out to one quarter of the yard by the lizard, which is rove through the quarter strop and hitched to the strop of the quarter block, or passed several times round the yard and the yard-rope; the yard-rope is then stopped into the bunt with a ropeyarn. The tripping line, coming from the opposite or lower yard-arm, and rove through the eye of the lift and brace, is also stopped to the bunt with a ropeyarn.

Attend the parrel, lifts, and braces.

"Break the stops." "Sway away."

Let go the lower lift; by hauling upon the tripping line at the same time, the lower yard-arm is cleared of the lift and brace. "Lower away."

The upper yard-arm clears itself as the yard comes down.

(Accidents frequently occur by yard-ropes being stopped in with ropeyarns. A strop and toggle in the bunt of the yard to take both the yard-rope and the tripping line is sometimes used, a man being stationed to slip the toggle at the order "Break the stops.")

After sending yards down, how are they got ready for crossing?

Cast off the lizard, put the grummet over the upper yard-arm and secure the tripping line to the bunt.

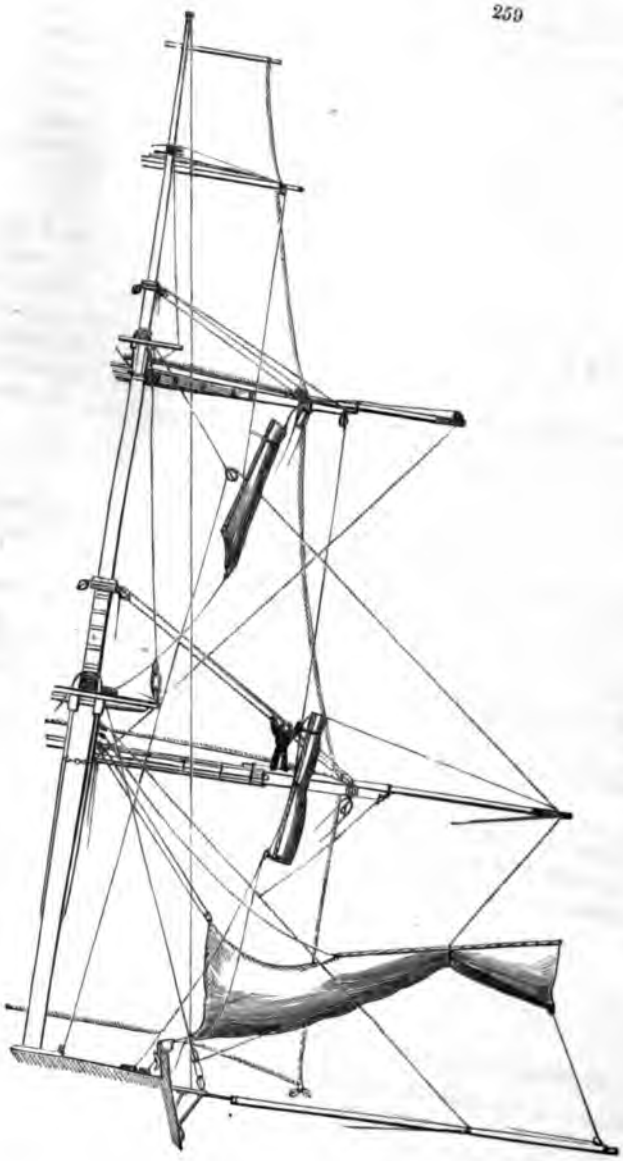
(If the lizard is used for crossing the yard, the yard-rope must be left stopped out.)

STUDDING SAILS.

(Studding-sails are more easily managed by keeping the ship away, if possible.)

How is a top-gallant studding-sail boom rigged in and out?

By men on the topsail yard: it is secured with a toggle on the boom, and a strop on the jackstay; the heel lashing being passed round the topsail yard, and secured to the jackstay.



How is a topmast studding-sail boom rigged in and out?

The boom jigger is hooked to a strop on the boom iron, and the boom rigged out by men on deck; when out, the jigger is shifted to the slings of the yard ready for getting the boom in again.

How is the topmast studding-sail boom secured?

The heel rope is secured with two turns round the boom iron, and through the bolt in the end of the boom, then expended round the jackstay and boom.

How is the lower boom got out?

The long lizard carries the lower boom topping lift out to the fore yard-arm: pull up the topping lift and fore guy, ease away the after guy; as the boom goes forward ease in the lizard.

The lizard is sometimes only a pendant, and is hauled out by men at the yard-arm, who remain to ease it in when the boom is square. If not eased in, the boom would not come aft into its place when required after the lower studding-sail was taken in.

How is a lower boom brought fore and aft?

In taking in the lower studding-sail, pull up the tripping line and boom topping lift together without starting the tack. When the boom is high enough to swing into its place, take a turn with the topping lift, and ease away the tack. After the studding-sail is in, ease away the fore guy, haul aft on the after guy.

If the lower boom gets forward under the bows, how is it brought aft again?

Knot the lower halliards and tack together, run the knot out to the boom end, take a turn with the tack, haul taut the boom brace, and pull up the lower halliards, and as it comes out from the bow, the topping lifts and after guy.

How is a topmast studing-sail boom sent up or down?

Rig the boom close in, and take the rigging off, bend the topmast studding-sail halliards outside the centre of the boom with a rolling hitch, or two round turns and half hitches to prevent it slipping in or out, pull up the halliards, attend the boom jigger, when clear "lower away" the outer end first. A boom is sent aloft by bending the studding-sail halliards in the same way, and stopping them to the outer end, when the boom end is clear in the iron, cut the stop and pull up the boom jigger, or the

inner end may be sent up first; then haul out on the halliards and point the boom.

What is the best and quickest bend for studding-sail halliards?

A strop sliding on the halliards which has a stopper knot in the end—the halliards are taken round the after side of the yard, and the knot toggled into the strop which is on the fore side between the yard and the sail (Figs. 91, 92).

How is a topsail yard secured for setting studding-sails?

See the yard braced well in, and the lift jigger taut, put a top burton, hooked to the topmast cap, on the weather yard arm, for a preventer lift.

How is a top-gallant yard secured for setting studding-sails?

A top jigger is put on the weather lift in the top, and the yard braced well in.

Before setting studding-sails, are the topmast studding-sail halliards and tack before or abaft the lower halliards?

Before, or else the topmast studding-sail would be set abaft the lower halliards.

How is a topmast studding-sail set?

The boom being rigged out, and secured, and the studding-sail gear bent, pull up the halliards and tack, keeping fast the end of the deck sheet; the stops are cut by a man on the lower yard, then haul out the tack, and pull up the halliards. The short sheet is rove through a block secured to the inner boom iron on the lower yard, and belayed in the top (Fig. 260).

As soon as the topmast studding-sail is set, what is done with the down-haul?

The down haul and deck sheet are hauled up from abaft the yard, and sent down outside and before all on deck, ready for taking the sail in.

How is a top-gallant studding-sail set?

The same as a topmast studding-sail, but there is no short sheet, and the long sheet is left abaft all (Fig. 260).

n setting a topmast or top-gallant studding-sail, which is done first, the tack hauled out or the halliards pulled taut up?

The tack is hauled out first, as the sail then holding less wind brings less strain on the boom.

STUDDING SAILS SET

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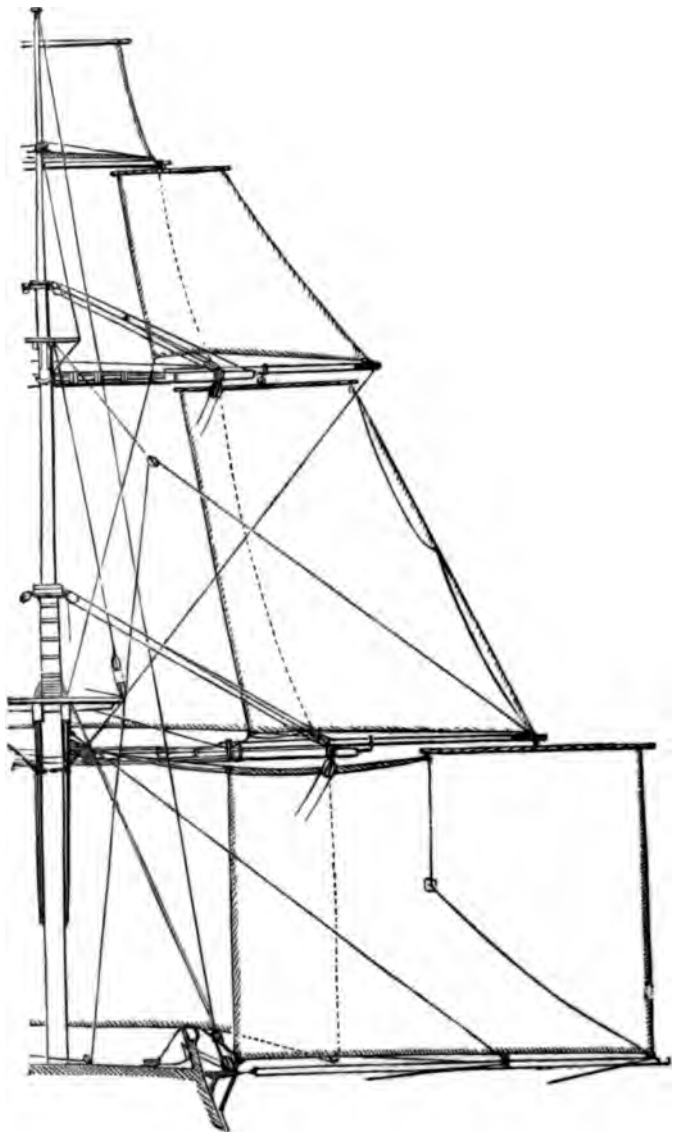


If you want to get a pull of a topmast or top-gallant studding sail tack, after the sail is set, how is it done?

Lower the halliards a little, then haul out the tack, checking the sheet, and hoist away again; or keep the ship away.

How is a lower studding-sail set?

The topmast studding-sail tack and boom brace being taut, pull up the inner halliards to keep the sail off the deck, haul out on the outer halliards, and tack, keeping the end of one sheet fast. When the strop is slipped, pull up the outer halliards, then haul out the tack, pull up inner halliards, and haul aft the sheet (Fig. 260).

How is a studding-sail dipped before all?

Lower the sail well down. A man on the lower yard arm gathers in on the after part of the studding-sail until he catches the outer leech, he then carries the outer yard arm well in along the yard abaft the lift, until the upper yard arm is clear of and before the reeftackle, then let go and set the sail again.

How is a lower studding-sail taken in?

Ease away the tack, pull up the tripping line until the clew is up to the yard, ease in the outer halliards, pulling up the tripping line and inner halliards; when the sail is over the forecastle, lower it on to the deck.

If the lower boom topping-lift is pulled up high enough (before starting the tack) for the boom to swing into its place, the work is lightened.

How is a top-gallant studding-sail taken in?

Ease away the tack and halliards together, hauling down on the sheet and downhaul. Men on the topsail yard help to pass the sail abaft all. Or, if the other sails will allow it "luff," when the sail lifts "haul down."

If the sail gets before the top-gallant sail, and the ship cannot be kept away, let go the tack, ease down the halliards a little and it will capsize behind the top-gallant sail; by hauling on the downhaul and sheet, with a man on the topsail yard to help the sail round the leech of the top-gallant sail, the sail will come in.

Don't let the man at the topsail yard arm support himself by the leech of the top-gallant sail, as the weather sheet is very likely to carry away from the extra strain of the studding sail.

Or lower the studding-sail down before the topsail. The

man on the yard can hang the outer yard arm and hitch the studding-sail halliards round it (turning the sail into a flag), then pull up the halliards and haul upon the downhaul.

(A top-gallant studding sail is a most difficult sail to manage, owing to its being taken in on the weather side of the other sails.)

How is a topmast studding-sail taken in?

Let go the short sheet, lower the halliards, hauling on the downhaul until the outer yard arm is close to the boom, and the inner yard arm clear of the preventer main brace and the bowline, then ease in the tack, and haul the sail down by the downhaul and deck sheet.

What precaution is necessary after taking in studding-sails?

See the burtons off the topsail yards, and the jiggers off the topgallant lifts.

After taking in the topmast studding-sail, how is the gear got ready for setting the sail again?

The tack and halliards bent together are hauled up on the lower yard before all, and sent down on deck abaft all, inside the lower brace.

After taking in studding-sails, what is done with the gear?

The boom brace, both parts of the topmast studding-sail tack, and the outer halliards, are triced up together under the top by the lower studding-sail tripping line. All the gear is stopped along the jackstay, up and down inside the lower rigging, and along the ridge rope, leaving a sufficient bight for bracing the lower yard sharp up. Top-gallant studding-sail tacks are left ready, and the topmast studding-sail halliards are stopped into the futtock rigging.

How is a topmast studding-sail made up?

Unbend the tack and halliards, and place the sail with the fore side on the deck, overhaul the downhaul, gather the sail over towards the head, laying each bight of the downhaul on the top of the sail and taking it to the inner yard arm before rolling up, "Roll up," leaving the downhaul block and tack toggle out clear ready for bending the tack.

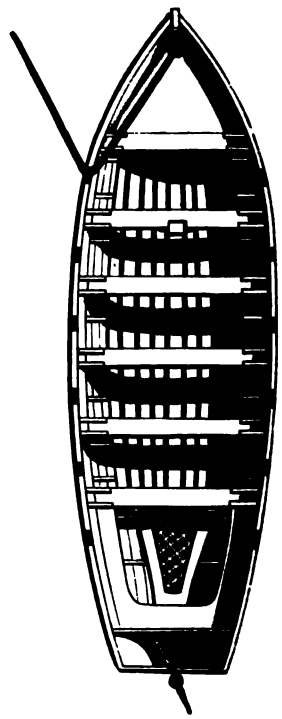
How is a lower studding-sail made up?

Unbend the tack, halliards, and tripping line—make the sail up with the foreside on the deck—roll up square, leaving out the tack toggle and the block and thimble ready for reeving the tripping line.

HAULING A BOAT UP—TOWING ALONGSIDE.

261

262



If blowing hard, and you wish to carry on with the topmast studding-sail, how is the boom secured?

By seizing a toggle to the bight of the lower halliards above the studding-sail boom, then haul taut down on the end of the halliards on the forecastle, thus making a martingale.

BOAT SAILING, ETC.

Two forces act in turning a vessel round—the rudder and the sails.

(The position of the screw and the form of a ship's bow are not here taken into consideration.)

In using the rudder with the boat going ahead—if the bow is to go to port, the rudder is put to port, and the tiller or helm to starboard, and *vice versâ*.

With the boat going astern, the helm must be put in the opposite direction to what it is if she is going ahead.

Little dependence can be placed on the rudder steering a vessel going astern (see page 123).

What is the best way to make fast a hawser for hauling a boat up on the beach?

Pass the hawser round the boat close to the keel, keeping it from getting under by hanging it, then hook the tackle to the foremost bight (Fig. 261). Boats that are continually being launched and hauled up on a beach are usually fitted with a rope rove through the forefoot and knotted.

If the painter was used it would drag the bows of the boat down.

If uprights are conveniently fixed—Pass a hawser from the boat, bearing against the nearest upright, and secure it to one some distance ahead; then by hooking a tackle to the hawser, half way between the uprights, and pulling at right angles, great power is gained.

How are the tackles for hoisting a boat up fitted?

The lower block should be fitted with a thimble, and the slings with a hook.

In fitting boats' tackles, why is the hook fitted in the slings?

If fitted in the tackle, and the boat were lowered at sea, it

would probably hook a man out of the boat, or catch under the gunwale or one of the thwarts.

In hoisting a quarter-boat up, how are the steadying lines passed, and what is the use of them?

From the hook in the slings to the sides of the boat, to keep it upright. If no steadying lines were used, the slings being hooked to the bottom of the boat, below the centre of gravity, would cause her to capsize directly she was out of the water.

What precautions are necessary in hoisting a quarter-boat up at sea?

See the lower deck guns in and ports lowered, cross the lifelines, pass two hook ropes out of the main deck ports, and keep them well manned and attended as the boat goes up; as the ship is rolling towards the boat run her up quickly.

With two spars extending from the edge of the mizen chains to bolts in the ship's side clear of the guns and ports, always put on when preparing for sea, the boat is kept from getting under the channels—with long davits this would not be required for the outer boat, but it would save the inner one.

How are the lifelines secured for taking a turn with the boat's falls?

The bight is rove through the slings and over the davit-head, then two or three round turns round all parts.

In hoisting a boat in a tideway or at sea, which tackle do you hook first?

The foremost one, and attend the rudder.

In lowering a boat in a tideway or at sea, which tackle do you unhook first?

The after one, leaving the boat towing by the foremost one, and attend the rudder.

(At sea a boat rope should always be passed from the boat to the fore chain.)

Why not unhook the foremost fall first?

Because if the boat is towed by the after fall, the bows will either give a send in against the ship's side, or go right off. If the ship is going fast through the water, the boat must then either be capsized or stove against the ship's side.

How are boats' gripes fitted for lowering quickly?

The lanyard should be passed through a slip secured in the mizen chains, as a lashing takes a long time to cast off when a man is overboard (Fig. 265).

What precautions are taken to insure a boat being lowered quickly and safely?

Directly a boat is hoisted up, see the boat rope secured in the fore chains and to the inner side of the foremost thwart of the boat, with an easy hitch—being stopped up to the main chains, &c., to keep it from getting foul; the falls clear for lowering, the gripes ready for slipping; the rudder and tiller shipped, and the plug in.

(On getting into a boat which is to be lowered after "*a man overboard*," order all the extra men out of her; as she is being lowered, station one man to unhook each fall, one to slip the hitch of the boat rope at the proper time, and the rest to look after their oars; attend the rudder yourself.)

What precautions are necessary in hoisting a stern boat up at sea?

Reeve the boat's painter through a link of the rudder chains, having the end in the boat ready for slipping. Hook the boat's falls, keeping them well overhauled. Then with the ship hove to and looking out for a smooth, man the falls, the foremost one best. Haul taut and hoist away.

The danger consists in the ship having way upon her: the boat is then liable to get broadside on, in consequence of letting go the painter too soon, and hauling taut the after fall before the foremost one; the water then pressing on the side of the boat will swamp her. If she misses being swamped, directly the boat is out of the water she must swing in against the stern, and consequently get stove.

If there is much sea on, a rope from the midship part of the boat should be led in through a port, and the lifelines crossed.

In lowering a stern boat, immediately she reaches the water let go the after fall, attending the foremost one as requisite.

If a number of boats are towing astern, what is the danger to a boat shoving off from the stern ladder?

Unless she is veered astern of all the other boats, she would probably get athwart-hawse of some of them.

Towing a boat alongside a ship, or along a beach, where do you make fast the warp?

To the foremost thwart, or passed through the foremost rowlock (Fig. 262).

How and where do you make fast another boat's painter for towing?

To the after thwart, or with a toggle between the two after thwarts, your own painter before being given to a

boat ahead of you should be toggled to the foremost thwart (Fig. 263). Towing with a number of boats, the lightest one should take the end of the hawser, and each of the others should form astern, securing the hawser to the stem and after thwarts; this prevents the boats being strained (Fig. 264). Should another boat join and wish to form ahead of the line, care must be taken to pass clear of the oars, and to form exactly ahead of the other boats; be very careful that the boat is steered steadily whilst securing the painter of the boat astern. In altering course the headmost one is to turn first, and then the rest, one after the other. If the sternmost of any two boats steers a little to the opposite quarter she will assist the headmost one in turning.

Why not make the towing lines fast to the bow and stern bolts?

With a number of boats towing at the bows, and the weight of the ship at the stern, the boat would be pulled to pieces.

In laying out a warp, what should be done with the end before coiling the warp?

Have plenty of end in the bows ready to make fast, then the bowman can secure the end whilst the rest of the men are keeping the boat steady with their oars.

Where would you coil the warp or hawser?

Lay in the two after oars and coil in the stern sheets; if warping a large boat ahead, coil the warp as it comes in into another boat ready for sending ahead again.

How should a warp be laid out to windward?

Take all the warp in the boat—pull up to windward, and use it as a guesswarp to drop to leeward by.

How should a warp be laid out to leeward?

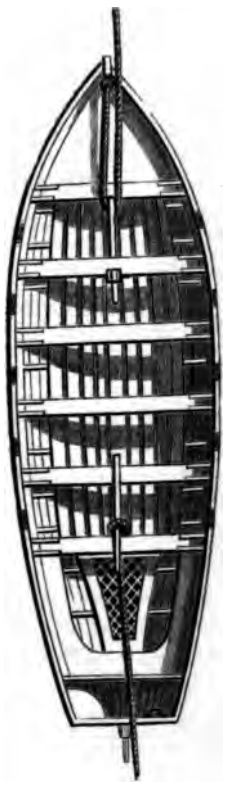
Take most of the warp in the boat—allowing the ship to pay out more after you have shoved off, until what is in the boat is sufficient, then pay out from the boat.

When watering, what is the use of rafting casks?

If the watering place is close to the beach, and the hoses from the pump rigged on shore are long enough to reach the boat, the casks are not disturbed; but if the casks have to be rolled up on shore, and when filled rolled down to the beach again, they are rafted off to the ship, as time would be lost, and the boat knocked to pieces if the heavy casks were hoisted or parbuckled into the boat.

TOWING ASTERN.

263



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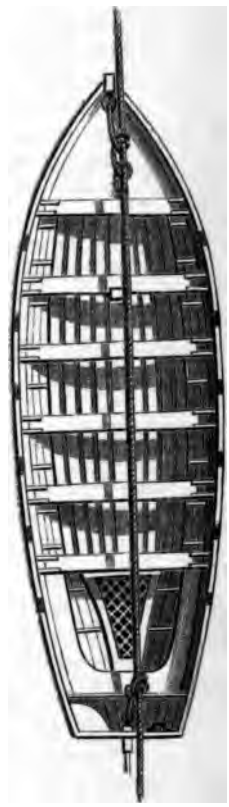

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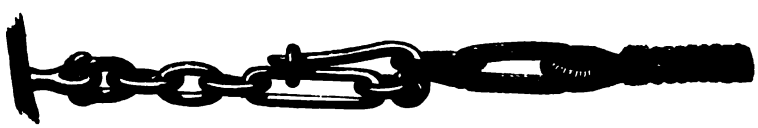

RAFTING CASKS.

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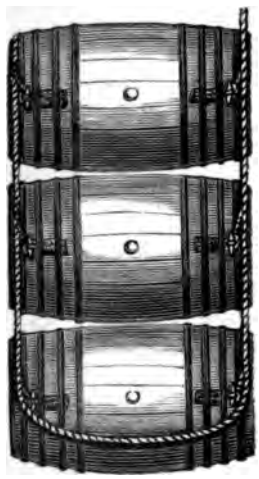

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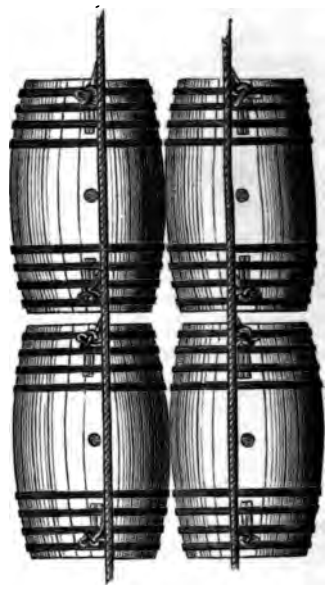

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269

On a coast with a surf, the casks must be rafted off to the ship, as a heavy boat would be swamped in going out, when a light one could get away safely.

In watering, before leaving the ship take plenty of lengths of hose, iron, and wooden pump handles, spanners, bung-starter, bungs, and bung clothes; appoint a place for washing clothes clear of the watering hole; divide the men off into pumping parties, and put the end of the suction hose into a sunken bucket to keep the gravel and sand out. The suction hose should be as short as possible. As the pump and hoses may contain salt water, pump a little overboard before putting the hose into the casks.

In rafting casks, how are they towed?

Broadside on (Fig. 266). Or in pairs end on (Fig. 267).

In rafting casks, how is the hawser made fast for towing?

Stopped to beckets under the hoops at the end of each cask, never rove through the beckets (Figs. 268, 269).

Why should not the hawser be rove through the beckets?

Because it would bring all the strain on the last cask, and when casting off the end one the others would be very liable to get adrift.

When watering from a beach, with the wind blowing towards the shore, how is the boat anchored?

Pull or sail in, let go the anchor well off shore, then back the boat in, sending a hauling line on shore for the watering hose. A dingy is very useful for landing the men.

In coming alongside with a heavily laden boat, what precaution would you take?

To lower the sails in good time, as a loaded boat carries her way much more than an empty one.

In loading a boat, what precaution would you take?

To keep the well clear ready to bale the water out.

In towing a spar, which end would you tow first?

The smallest end.

If a boat cannot fetch the ship in consequence of wind or tide, what assistance can the ship render?

Veer a buoy or small boat astern and haul the boat up. One buoy will not carry the line far astern, so two or three should be used, if required, or a buoy with the leadline attached may be carried to leeward by means of a kite.

Why should not the oars be tossed in a boat alongside a ship at sea?
The blade of the oar might catch under the ports, &c., and send the loom through the bottom of the boat.

NOTE.—The same reason will apply to a mast up in a boat.

When the helm is moved either way, where is the centre of rotation?
A vessel moves round on a centre well forward, the stern actually moving round, the bow remaining nearly steady. For instance, when a steamer or boat is leaving a pier, if the helm is put hard over at once the stern will be taken against the pier; therefore, if in danger of fouling anything, remember that when the bow of the boat has passed clear, the helm should be put over, so as to send the *stern away* from the danger.

To alter course in a boat or ship with sails, consider that the vessel balances upon a centre, one end approaching the wind, and the other moving away from it; then knowing which end is to be brought nearer to the wind, the bow or the stern, take the sails away from that end, setting them as flat as possible at the other; or in other words—take the sail away from the end which is to approach the wind, and set the sail at the end which is to be acted upon and blown away from the wind.

Explain how to tack a boat.
The order is given, "*Ready about.*"
When everything is ready the helm is put down, and the order given, "*Ease off the jib sheet.*" As the boat comes up to the wind the jib is borne out to leeward, and aback to assist in sending the boat's head round.
When the wind is right ahead, "*Shift over.*" The sheets are shifted over, the fore sheet being hauled aft at once, the main sheet eased off; when the fore sail is full, "*Let draw,*" the jib and main sheets are then hauled aft.
Boats are frequently sluggish in paying off from the wind with the jib sheet to windward, in consequence of the great pressure of water on the lee bow from leeway, the boat having no headway—the quickest way to get her to her course is to let draw the jib and to slack the main or mizen sheet—this gives headway—prevents her stern being driven to leeward, and consequently her bow falls off.
Boats with large jibs are dangerous; whilst the bow is being driven sideways with the jib sheet to windward, the pressure is so great against the lee bow under water

that the boat heels over more than when she has headway, and the jib sheet is frequently obliged to be let go, and cannot be hauled aft until the boat has good headway (Fig. 301).

In tacking a boat with a lug, how will you shift over the sail?

When the boat is nearly head to wind, lower the sail sufficiently to allow the after yard-arm and sail to pass round before the mast, then hoist it again on the other tack.

The men who dip the sail should stand on the lee side close abaft the mast, and gather the sail in to them, working towards the after yard-arm—this keeps the fore part of the sail acting as a jib aback all the time of dipping. If the bow has not gone off enough keep the after yard-arm close to the mast, and do not shift the tack across—when the boat is round, let go the yard-arm and shift the tack over to the weather bow.

How do you know when the wind is right ahead?

By the mizen shaking.

The foremost yard-arm being the shortest, why not dip it in preference to the after one?

There would be no jib left to pay the boat's head off, and unless the halliards came down forward a turn would be taken in the tye round the mast.

What precaution must you take whilst dipping and shifting the tack across, to prevent the boat missing stays?

Let go the mizen sheets.

What is the advantage of the halliards being made fast at the dipping mark to the midship part of the boat?

The sail cannot be lowered too low, and the halliards do not require to be shifted over. If the halliards are secured to the side of the boat and shifted over each time she goes about, they form a shroud to support the mast.

In tacking, suppose the boat gets sternway, how do you insure her bow paying off the right way?

The helm is shifted, as it acts in a contrary way, but little dependence can be placed on it.

By sending all hands aft to the old weather quarter, the boat is sure to pay off the right way, in consequence of the pressure of the water being more on the immersed quarter than the other. The usual practice is to bear out the mainsail, but it never has the desired effect, in consequence of the wind in the sail depressing the wrong

quarter—for instance, if the wind is ahead, and it is desired for the bow to pay off to starboard—if the mainsail is borne out on the starboard quarter in the hope of sending her stern to port, it will have an opposite effect, as it at once depresses the port quarter, which, then being the largest, the water acts against it more than the smaller quarter, and causes the stern to turn to starboard, even against the mainsail, and the more she turns, the more pressure the mainsail will have to depress the port quarter and side of the boat; but if the men are sent to the starboard quarter and side of the boat, the stern is at once forced to port, and the bow to starboard, as desired (Fig. 304).

In running with a lug-sail, where should the tack be hooked?

To the bow, not to the stem.

What is the use of the hook in the stem?

It enables the boat to sail closer to the wind, and if the sail is handled well it is more convenient in tacking, as the tack need not be shifted.

(A boat with a lug-sail will insure tacking if the tack is hooked to the bow, as in going about it forms a better back sail than if hooked to the stem.)

Explain how to wear a boat.

"*Put the helm up*," and "*Ease off the after sheets.*" When the wind is well on the quarter, "*Shift over*" the sheets; take in the slack of the sheets quickly as the sails gybe. "*Ease off the head sheets*" until the boat is close to the wind, then "*Haul aft.*"

If blowing hard, the sails should be brailed up before gybing.

With a dipping lug, when do you lower the sail in wearing?

Just before the wind is right aft. If the sail is allowed to gybe it is very difficult to lower, as the halliards are between the mast and the sail, and the sail is taut against the mast.

How will you dip the sail?

The same as in tacking.

Explain how to take in a lug sail.

Check the sheet and haul down on the luff or foremost leech. If the after leech is hauled upon it fills the sail, bringing so much strain on the traveller that it cannot come down; by hauling down on the luff of the sail on the weather side of the boat with the sheets checked. the wind is taken out of the sail and it comes down easily.

F. Pierce C. Simms.

Keep her Bows on"

How can you trim a boat with the men?

By sending the men forward, the stern of the boat is raised more out of the water, the after sail has then more power to blow the stern to leeward than before, and therefore sends the boat's head into the wind; by sending the men aft, the boat's head falls off.

Why is the fore sheet to be slacked whilst hoisting the jib?

The jib acts as a stay, and the fore sheet pulls the head of the mast aft, therefore the sheet should be slacked to allow the mast-head to go forward whilst the jib is being hoisted, and then hauled aft again.

How do you reef a boat's sail?

When the men are stationed, lower the halliards, shift the tack and sheet; hauling the foot of the sail taut along the boat, tie the points with a slip reef-knot, hoist the sail again as quickly as possible. If the sail is rolled up taut it forms the neatest reef, but it also forms a bucket to catch a sea.

How do you shake out a reef?

The reef is first shaken out keeping the sail set, then, when ready, the halliards are lowered, the tack and sheet shifted, and the sail set again as soon as possible.

Why is it dangerous to use lee oars under sail?

In a squall, if the lee oars catch the water, it may split the gunwale or capsize the boat.

When laying on your oars under sail, what should be done with them?

Always fling them out of the rowlocks and let them rest abaft on the gunwale.

If they were left in the rowlocks and the loom of the oar were not kept well down, it would "catch a crab."

In going through a heavy sea, why would you back the boat in?

The bows of the boat must be kept out to take the force of the wave, as the boat rises so much better at the bows than she would at the stern were she running bows on to the beach.

Why should not the stern of a boat rise to a sea equally as well as the bow?

A sea striking a boat in the bow meets the body of the boat, lifts it up, and passes underneath it; but on striking the stern, it finds the upright part of the run, and having nothing to take hold of to lift the boat with, it must pass

over and into it. A boat is also usually higher out of the water at the bow than at the stern.

Why should you pull out to meet each wave as it approaches?
If in backing towards the shore the boat is allowed to have much sternway, on the wave overtaking her the sea will raise the bows, and likewise striking that end of the boat first, gives it more way than the stern, which is much below it; therefore the boat must either run her stern under or broach to and capsize.

Which is safest to enter broken water, under oars or sails?
Oars, as then the boat can be turned in any direction. Sails would be liable to get aback or becalmed.

When is a steer oar used?
When a boat is pulling head to wind and sea; the rudder being then of no use, from the boat having little headway.

If caught in a gale of wind in a boat, and you cannot run, what is best to be done?
Lash all the gear together for a breakwater; let go the anchor (never mind whether it takes the bottom or not), making fast the cable with a span to the gear; then let the boat ride behind this breakwater with a span. If a sail is loosed, it will spread itself on top of the water. This will prevent the boat drifting as much as she otherwise would; it keeps her head to the sea, lightens the boat, and the gear must break the sea a little. Keep a few oars in the boat in case of breaking adrift.

If sailing in a boat take care to have your sails properly set, otherwise she will be both unsightly and unmanageable.

Remember that the *rigging helps the mast* to support the sail, not *vice versâ*, therefore never set up the lee rigging too taut, or the mast-head will be wrung off when you go about.

As a general rule a reef should be taken in directly the boat begins to wet.

Get the wind out of the sail if you want to manage it.

Never sit on the gunwale, stand on the thwarts; belay sheets or let go the helm.

Keep the men out of the bows of the boat, and make them sit low down.

Keep the boat stem on to a heavy sea.

Don't overload a boat, particularly with men or sand, as sand is much lighter when dry than when wet.

If a boat is swamped or capsized make all the crew remain by her, as the boat will assist those who cannot swim.

In using the rudder do not put the helm down too suddenly.

In ballasting a boat, water casks or breakers are preferable, being the safest, as in the event of a capsize, they, as well as the boat, will float. Iron or sand ballast stows much lower, and is therefore better for the boat; but if she is capsized it will carry her to the bottom, leaving nothing for the crew to cling to.

If on a wind, and there is a doubt about weathering a ship, or any danger, "*Go about*," never luff or shake the sails, as the boat losing all way through the water becomes unmanageable, and drifts on to the danger you wished to avoid.

Sling a dipping lug $\frac{1}{3}$ from the foremost yard-arm; standing lug $\frac{1}{4}$.

If sailing a match and it comes on a calm, a boat can be jerked ahead.

FITTINGS AND STOWAGE OF ANCHORS AND CABLES.

Parts of an anchor.

Shank.—The main or middle piece of the anchor to which the ring and stock are secured at the upper, and the arms at the lower end (Fig. 295).

Ring.—Is at the upper extremity of the shank, for attaching the cable to (Figs. 270, 271).

Stock.—Made either of iron or wood—it crosses the upper part of the shank at right angles to the arms; if the anchor falls on the ground with the stock upright, on the cable becoming taut, the stock, being longer than the arms, turns the anchor, and insures one of the arms hooking into the ground (Figs. 270, 271).

Arms.—Two opposite projections at the bottom of the shank, forming two hooks, one of which sinks into and takes hold of the ground (Fig. 295).

Crown.—The part where the shank and the two arms are joined together (Fig. 295).

Fluke or palm.—The enlarged triangular piece nearly at the end of each arm, and the part immediately inside (Fig. 271).

Bill.—The point at the extremity of each arm (Fig. 271).

What anchors are supplied?

Two bower, two sheet, one stream, one kedge.

How many chain cables are supplied?

Two bower, one sheet, and one stream, the three large ones being each 150 fathoms long.

NOTE.—A cable's length always represents 100 fathoms.

How long is a length of cable?

12½ fathoms.

How many lengths are there in each cable?

Twelve.

What is the use of the alternate lengths of cable having a swivel (Fig. 284)?

To keep turns out of the cable. When lying at single anchor if there were no swivels in the cable a number of turns would be taken in it, as the ship swung round each time the tide changed—and therefore an unfair strain would be brought on some of the links.

How are the cables marked?

At the first shackle, the first bar link has a piece of iron wire twisted round it; at the second shackle, the second bar link, and so on (Fig. 285).

Which end of the shackle is outboard?

The round end (Fig. 285).

How many hemp cables are supplied? (Fig. 289).

One sheet and one stream cable.

How many messengers are supplied?

One chain and one rope.

What is the use of them?

For weighing the anchor. The cable is secured to the messenger, and the messenger is taken to the capstan (Figs. 284, 285).

Where are the chain cables stowed?

In the chain lockers on each side of the mainmast; 2 on one side, and 1 the other.

What is stowed in the 4th chain locker?

The chain stream and the chain messenger.

Where and which side is the hemp sheet cable stowed?

In the tiers, on the same side as the chain sheet cable, as when taking the hemp cable out of the tier and up the hatchways, it is too large to bend, and must be led across to the opposite side of the ship.

If the stream anchor is on the starboard side, which tier is the cable stowed in, and why?

In the port tier, in order to lead the cable across from one side of the ship to the other as it is passed up the hatchway.

How are the bars secured to a capstan?

By pins through the heel of each bar, and a rope round the outer end, called a swifter.

How is the cable stoppered from running out?

The cable is first bitted (Fig. 273), and then secured with deck stoppers (Fig. 278) and a compressor (Fig. 3). The compressor confines the cable taut to the side of the chain pipe, and the deck stoppers shackled to bolts in the deck are secured to the cable.

What is the use of the compressor, and how is it worked?

It is a large iron lever at the bottom of the chain pipe, worked with a runner and tackle, which being hauled upon, jams the cable against the fore part of the chain pipe and checks it from running out (Fig. 3).

What is the use of a controller?

For stoppering the cable. It is generally fixed in the bows, and has a form corresponding to a link of the cable, which in running out is caught in the controller (Fig. 281).

A lever connected with the controller enables the cable to be raised to allow it to run out when required (Fig. 282); some ships have controllers forward and aft.

How is the water kept from coming into the manger at sea?

By hawse plugs and bucklers.

How is the lower deck capstan connected with the main deck one?

By drop bolts, which connect the spindles of the two capstans together.

How is a hawser taken to a capstan? (Fig. 4.)

With three round turns, and the inboard part always on top.

What is the use of pauls to a capstan?

When down, they secure the capstan from moving.

How is the inner end of a chain cable secured?

A chain slip is secured to a bolt in the sleepers, and the cable shackled to it; the slip being triced up in the chain locker, so that the cable may always be slipped if required.

What is the difference between an anchor and a joining shackle?

In an anchor shackle the bolt projects beyond the shackle, and is secured in with a forelock; in a joining shackle it does not project (Figs. 285—292), and is secured in with a pin going through both the shackle and bolt, and a leaden pellet put in on top of the pin.

NOTE.—When forced in, this pellet expands, and fills up a groove which is round the lug of the shackle on the inside, thus preventing the pin from coming out; whenever the pellet is removed the lead that remains in the groove must be extracted, this is called reaming; should it be neglected the next pellet will not hold, and the pin probably fall out.

WORKING ANCHORS AND CABLES.

When the cables are first brought alongside, which end would you get inboard first?

The after end, which is at once shackled to the slip in the chain locker.

Which hawse hole belongs to the bower, and which to the sheet cable?

The one nearest amidships to the bower, and the outer one to the sheet.

How is the cable bent to a bower anchor?

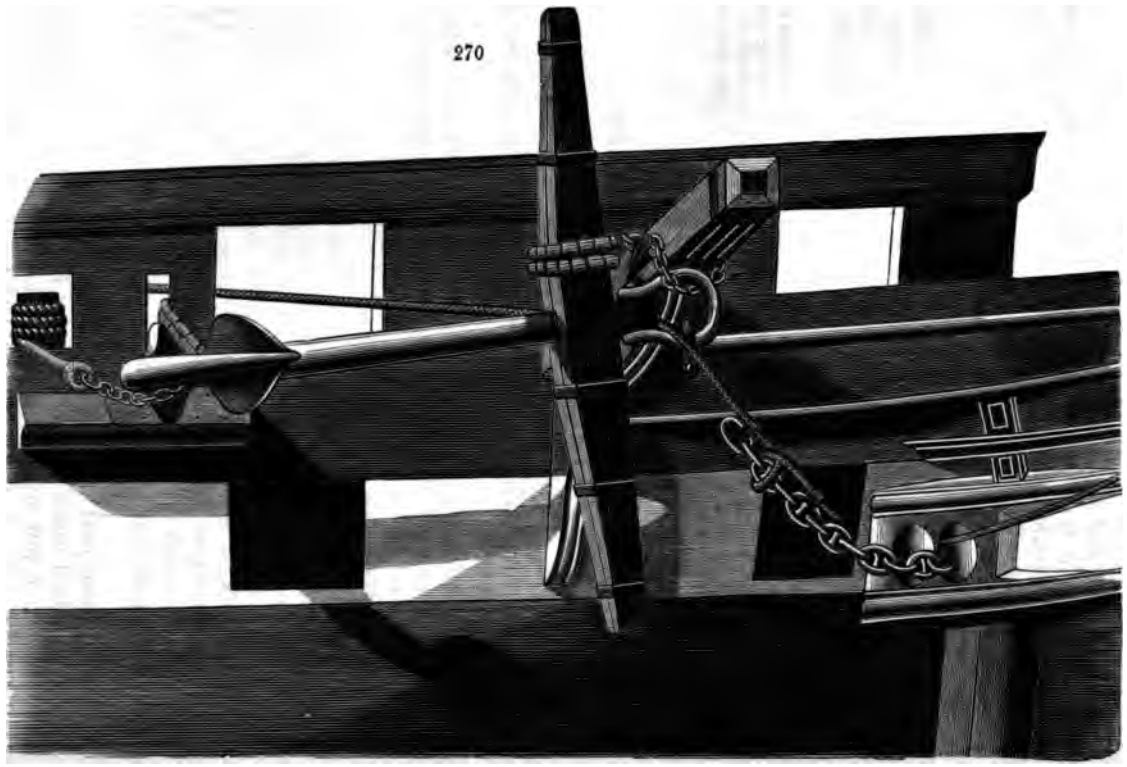
By the use of a ring rope and the fore bowline. The ring rope is rove out from the forecastle through the ring of the anchor from aft forward, under all the head gear, taken in through the hawse hole, and bent to the 3d or 4th link of the cable, being stopped to the first. The fore bowline assists to light the cable out. The shackle is taken out to the cathead from the forecastle (Fig. 270).

(If the cathead is far from the hawse hole, a rope is required over the bows to support the cable half-way.)

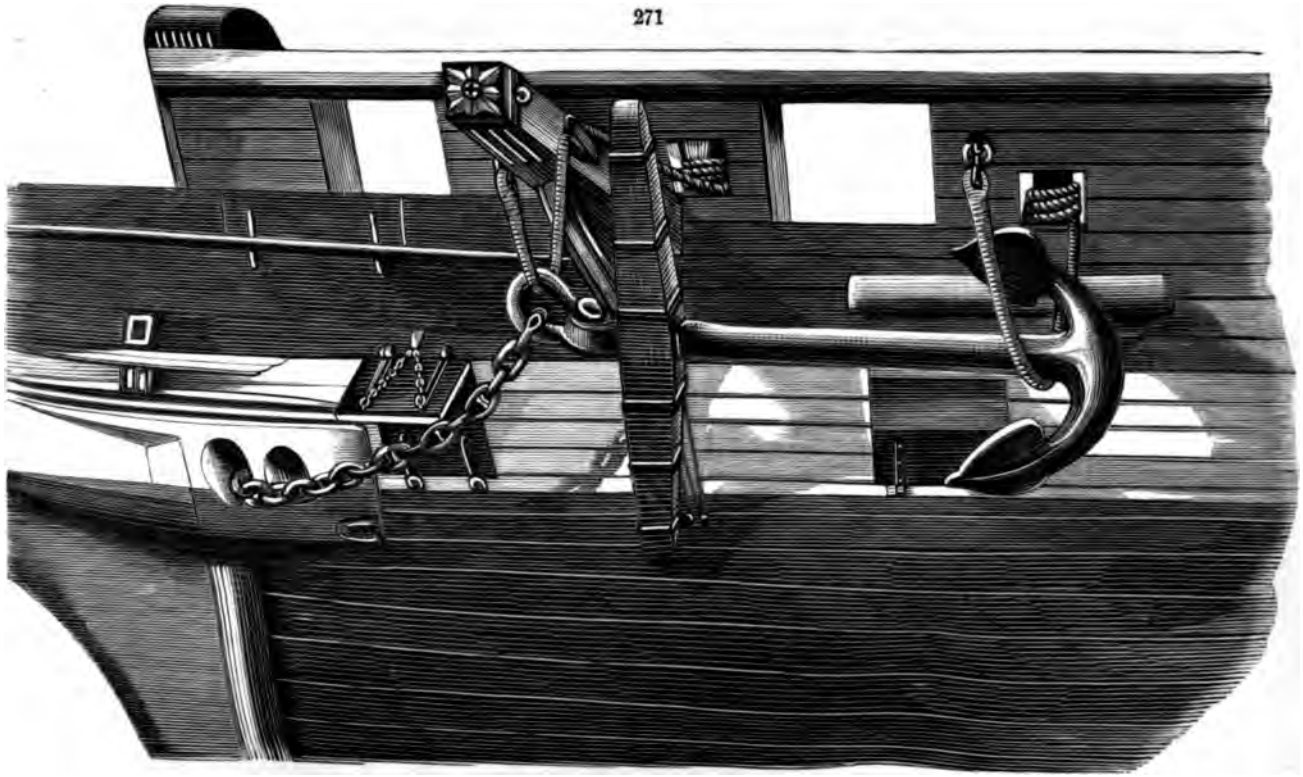
How, and to what part of the anchor, is the buoy rope bent?

With a half hitch round the inner fluke, and a running eye or clinch put over the outer fluke, forming a clove hitch on the crown of the anchor. If the first two fathoms of the buoy-rope is chain, it is not so liable to get foul of the anchor or cut against rocks.

BENDING A CABLE.

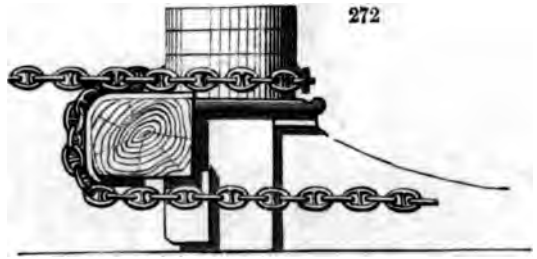


BOWER ANCHOR READY FOR LETTING GO.



CABLE BITTED AND RANGED.

272



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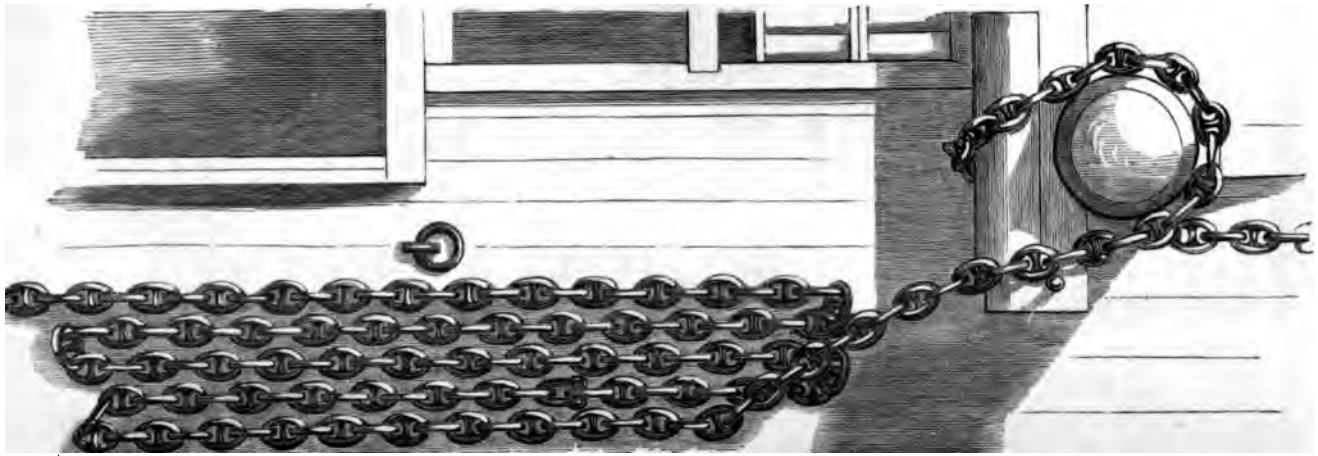

How is an anchor hung from the bows ready for letting go?

The ring is hung from the cathead by the cathead stopper, and the shank by the shank painter, which is secured to a bollard head, or a timber in the ship's side (Fig. 271).

How is a cable bitted?

The inboard end is on top and outside the bitt head; the riding part under and outside the bitts (Fig. 273); thus both parts are outside the bitts, the inboard end being on top (Figs. 272—293B).

How is a cable ranged?

Enough cable is hauled up out of the chain locker to allow the anchor to reach the bottom without being checked, and ranged abaft the bitts, the running part being outside (Fig. 273).

When at sea the upper turns of the chain in the locker are liable to foul, but too much chain should not be ranged, as it would probably foul the anchor by running out on top of it too quickly.

(Ship the bitt pin in the outer part of the cross piece to prevent the chain coming off as it runs round the bitts.)

How is a messenger got up and passed?

Haul up one end out of the chain locker with a hook rope, pass it round the capstan, ship a few bars and run it up, passing it along the deck and the fairleaders forward. The two ends are connected with either a long or a short joining shackle according to the next links, in order that it may fit the sprocket-wheel of the capstan.

What is the use of a buoy to an anchor?

It shows the position of the anchor; ships are therefore enabled to keep clear of it, and if the cable should be slipped without being buoyed it may be used as a help in recovering the anchor. A hawser with the bight lowered to the ground, and towed over the anchor by a boat fast to each end, will catch the upper fluke.

If the compressor is carried away, what means are there to check a cable whilst running out?

By using ring stoppers (Fig. 277). The two ends of the stopper are passed on different sides of the cable, forward through the ring bolt, then dogged round the cable working forward, the two ends being knotted together when sufficient turns are passed; the bights are kept overhauled and triced up to the beams, the part abaft the ring bolt by one stop and those before it by

another; by letting go the foremost stop the parts of the stopper catch the cable, and as they tauten breaks the after stop.

How is an anchor let go?

The cathead stopper and shank painter are fitted to go over tumblers; being slipped together they release the anchor (Figs. 275—295).

(See the cable ranged, the bitt pin in, and men attending the compressor.)

How is a rope stopper secured to the cable?

A lashing is spliced round it close to the stopper knot at the end, four turns are passed round the cable and the stopper working aft, the end is finished off round the cable working forward (Fig. 278).

Are the stoppers put on the cable before or abaft the bitts?

Abaft, so as to let the bitts have the greatest strain.

What is the use of the chain slip stopper? (Figs. 279, 280).

It is before the bitts for stoppering the cable, to bitt or unbitt it, or when unshackling to put the mooring swivel on, or to clear hawse.

How is a fish davit rigged?

With a fore guy, after guy, leading block for fish fall, runner block for topping lift, and fish block. A martingale is hooked to one of the bolts in the davit head (Fig. 283).

An up and down tackle hooked to the upper bolt in the davit head is sometimes used for a topping lift.

Which is the largest guy on the fish davit?

The after, as it has to bear the greatest strain.

What is the use of a martingale on the fish davit?

It keeps it from topping up backwards on hauling taut the fish fall. If the martingale is not taut, the head of the fish davit will top up as the fish is hauled taut, and consequently the heel must come out of its step and the davit capsize altogether.

In reeving the cat and fish falls, is the hauling part rove through the foremost or after sheaves first?

The foremost, as that coming taut first does not jam the afterparts (Fig. 288).

How is the messenger secured to the capstan?

The sprocket-wheel of the capstan has teeth in it, which correspond to and fit into every alternate link of the messenger.

ANCHOR TUMBLERS CONNECTED.

274

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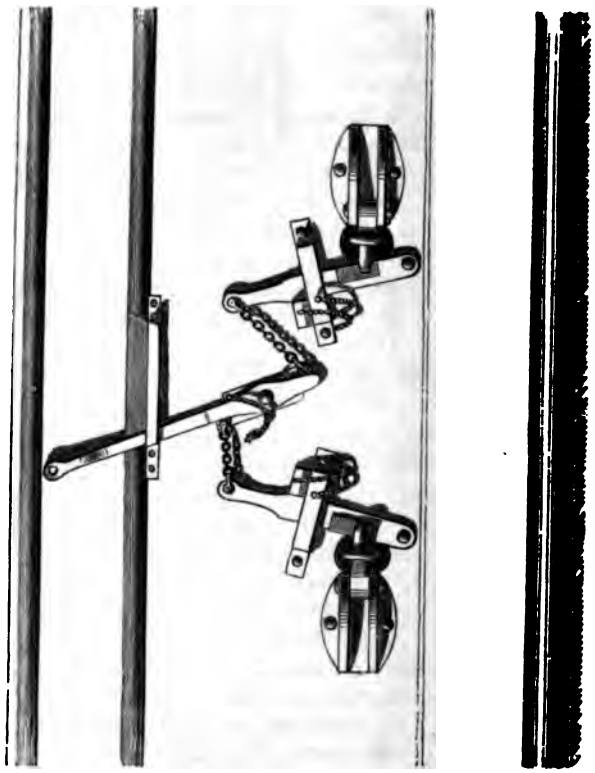

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CONTROLLER.

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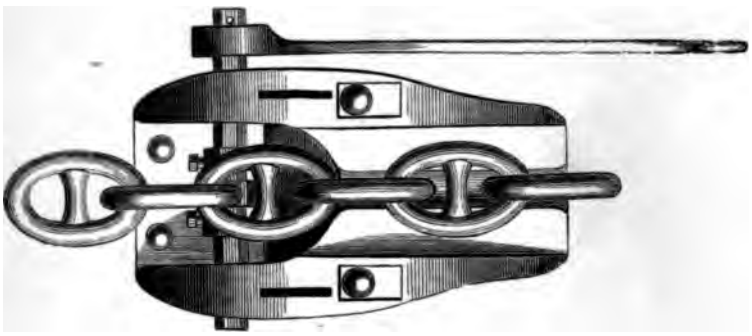

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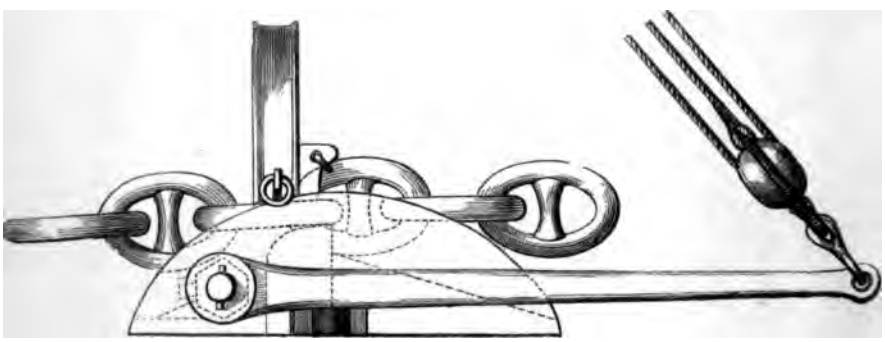
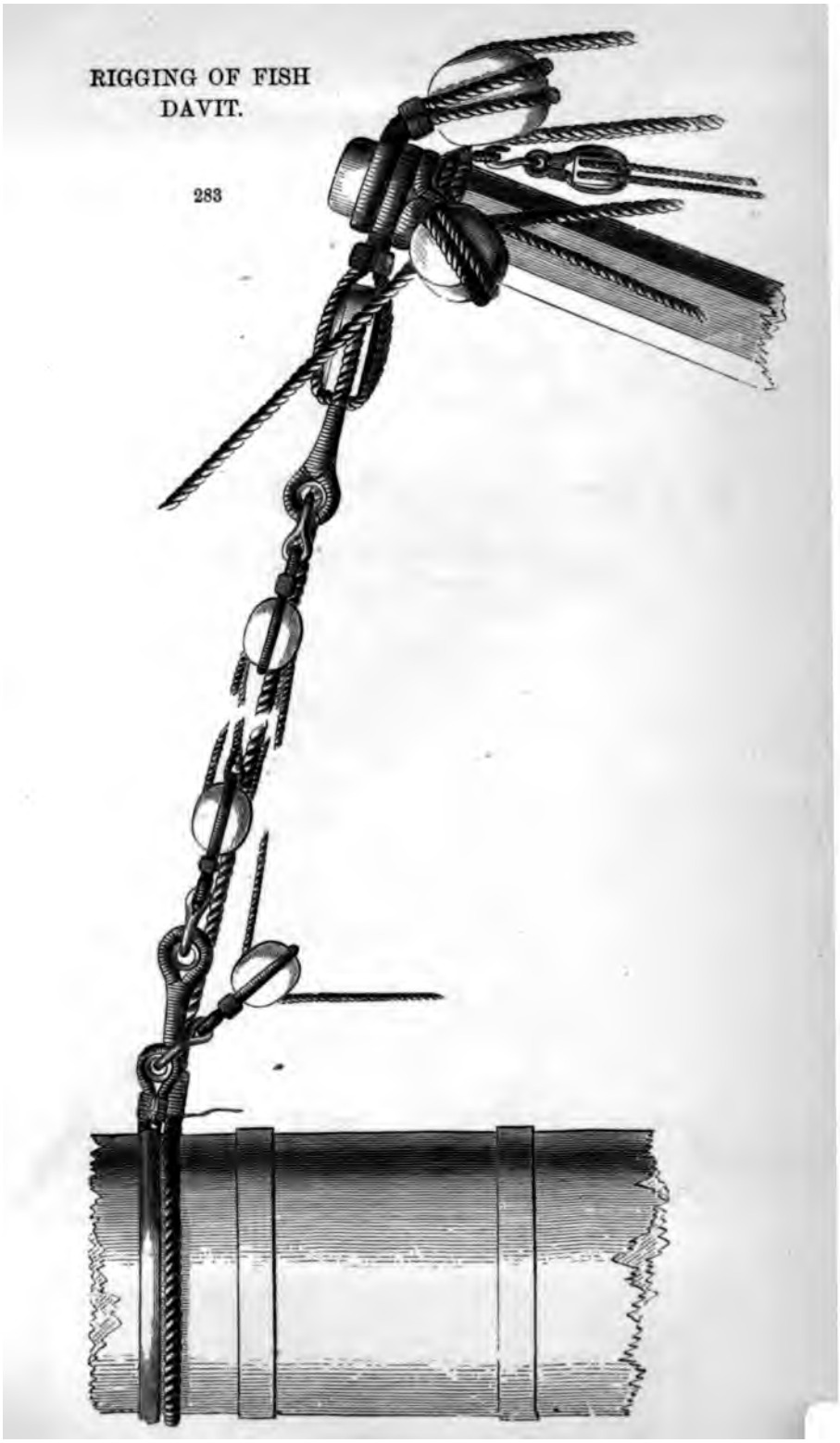


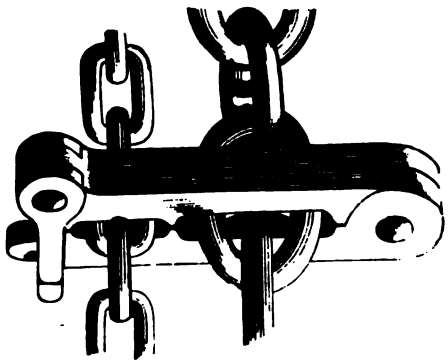
RIGGING OF FISH DAVIT.

283



CHAIN CABLE TAKEN TO A CAPSTAN.

286



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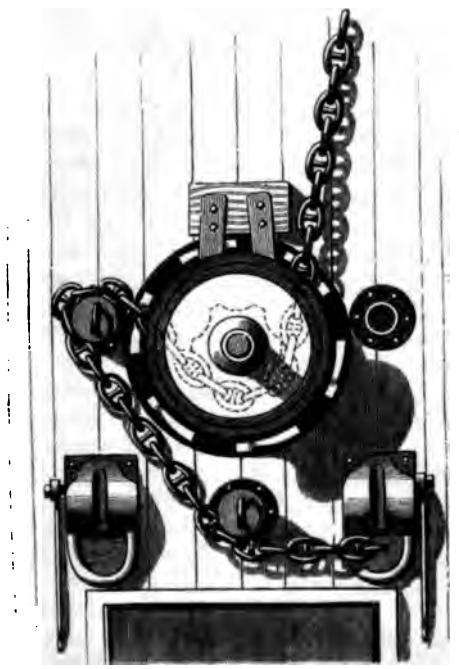


The messenger is an endless chain passing round the capstan and two rollers in the manger.

NOTE.—The hemp messenger has an eye in each end with a lashing, it is passed round the rollers forward, three turns are taken round the capstan and the eyes lashed together, the lower turn being on the same side as the cable that is to be hove in; to dip it for working the opposite cable, heave round until the eyes are close to the capstan, then cast off the lashing, slacken the turns, and pass the end of the messenger between them and the barrel of the capstan, render all parts until they fall into their places (*i.e.*, bringing the lower turn on the opposite side), then lash the eyes together again.

How is the cable secured to the messenger for weighing the anchor?

By rope or iron nippers (Figs. 284, 285, 286).

How is a rope nipper passed?

Take two turns round the messenger with the inboard or after end, then roundabout turns round the messenger and cable, and finish with two turns round the cable with the foremost end (Fig. 284).

Racking turns are sometimes obliged to be passed (Fig. 285).

How is an iron nipper used?

The messenger and cable are inclosed in a single shackle which is fitted with a hinge at one end and a slip at the other. Only one iron nipper is used at a time (Fig. 286).

How is a chain bar cable brought to the capstan?

Brown's patent capstans are fitted with a sprocket-wheel corresponding to the links of the cable, each link sinking into a corresponding form in the capstan (Fig. 287).

How is an anchor weighed?

Bring the messenger to the capstan which is rigged, the pauls being down and the bars pinned and swiftered; pass the nippers before the bitts. "*Heave round*" and unbitt. The nippers are continually being passed as the cable comes in at the hawse hole, the foremost end of each being dogged with the after end of the one immediately before it, both ends being held in the hand until the nippers are taken off as the cable goes aft, leaving three or four always on. If an iron nipper is used, the second one is put on as the first one gets well aft.

When the anchor is at the bows "*avast heaving.*" The cable is stoppered with the slip stopper and the nippers taken off. "*Hook the cat.*" "*Haul taut the cat*" (Fig. 288). Off slip stopper. "*Serge the cable.*" When sufficient is out, "*stopper the cable.*" "*Away with the cat.*" When high enough, pass the cathead stopper. Hook the fish

to the inner fluke. Put the stock pendant on the outer arm of the stock. Haul taut the stock tackle and attend it. "*Ease up the cat.*" "*Away with the fish.*" When the fluke is level with the billboard, pull up the fish topping lift. Ease away the fish martingale. "*Lower the fish*" and place the bill on the billboard. Pass the shank painter. "*Let go the fish.*"

See the anchor all ready for letting go again (Fig. 271).

The anchor buoy is hooked as soon as possible, and the buoy rope coiled down in the chains.

The cable is bitted as soon as the cathead stopper is passed, and a range is kept up ready for letting go if required.

What is the use of the stock tackle and pendant?

By dragging the upper arm of the stock in, it keeps the lower part clear of the ship's side, ports, bolts, &c.

If obliged to use a deck tackle to assist in weighing the anchor, how is it worked?

A runner and long tackle are fitted separately, the double block lashing or hooking to the runner, the end of which is secured abaft with the single block of the tackle. The runner block is shackled to a slip stopper which is secured to the cable. A whip is used to overhaul the tackle when required to shift it. The tackle is used without the runner, unless a heavy purchase is required.

What is the use of a hemp cable?

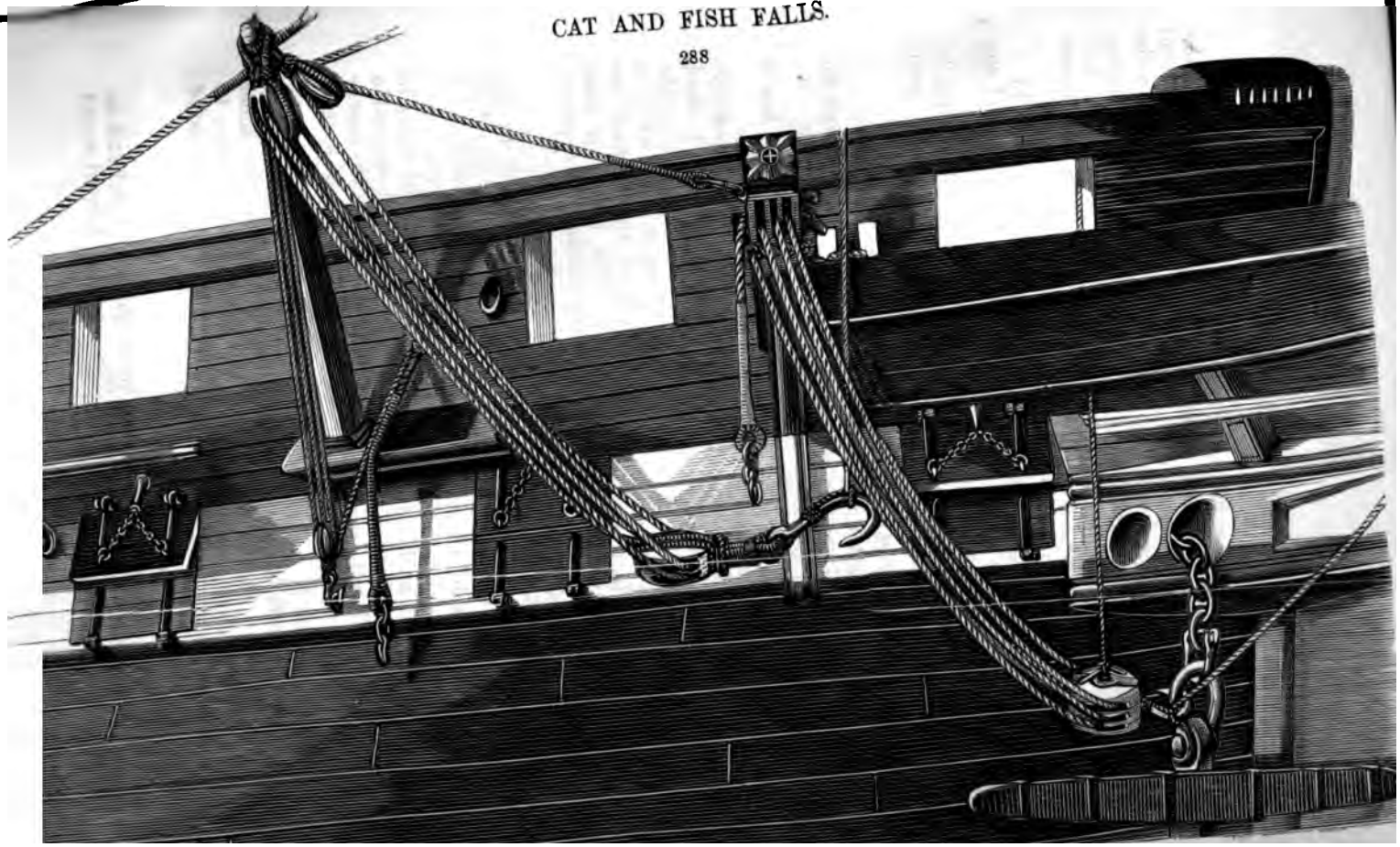
In carrying out a large anchor, it is difficult to use a chain cable, as its weight would drag the bow of one boat against the stern of the boat ahead of it, whilst the hemp cable allows them to remain a little apart, and being much lighter than a chain, it enables the boats to carry the anchor farther from the ship. The hemp cable is also used for anchoring in very deep water, as the hawse holes will not stand the weight of the anchor and several lengths of chain cable.

What is a ganger?

Two or more lengths of chain cable shackled to the sheet anchor. It enables part of the sheet cable always to remain bent, and keeps the hemp cable from being chafed against the ground.

How is a hemp cable secured to a ganger?

All hemp cables have a ropemaker's eye at one end and an Elliott's eye at the other. The eyes are formed round



ELLIOTT'S AND ROPEMAKER'S EYE.

289 B

289

290

large thimbles and two or three links introduced, the chain cable being shackled to the end link.

A ropemaker's eye is formed when making the cable, two of the strands being a long rope twisted up on the bight, and thus forming an eye at one end; an eye is also formed in the end of the third strand, each of its smaller strands being wormed round the cable without being spliced (Figs. 289B, 290).

An Elliott's eye is formed by splicing two of the strands together with a long splice, and the third strand is formed into an eye with an eye splice, leaving the ends to worm round the cable as before; the thimble is seized in, and the whole served over with good rope (Fig. 289).

NOTE.—The Elliott's eye (Fig. 289) is the outboard end of the cable.

What is keckling a cable?

In splicing the eye in a rope cable, long ends are left, which are wormed into the lays of the cable; this, served over with rope, is called "keckling," and keeps the end of the cable from being chafed against the ground.

How is a stream anchor and cable stowed in a boat ready for letting go?

The anchor is hoisted into the boat, and placed with the flukes over the stern, and the stock lying across the stern sheets on one or two capstan bars—a painted balancing mark on the shank being just inside the stern. Two lashings are passed—one from the stern-ring bolt round the shank, and the other from the ring bolt in the bottom of the boat, round both parts of the stock. All the gear is placed out of the way in the lumber irons. The buoy rope is bent to the crown, and the hemp cable coiled round the boat, taking care to allow room for the oars in pulling.

Before letting go, get a cast of the lead to ascertain the depth of water, and see sufficient cable clear.

The men not working should lie down under the thwarts.

When ready, cast off the lashings, see the buoy rope clear for running, stream the buoy, and heave the anchor over the stern.

If working a chain cable, the first bight should be stopped up round the outside of the boat.

A steer oar must be used to steer the boat.

Or the anchor is placed across the stern of the boat, and with two capstan bars hove over the stern. This enables

the rudder to be used, but it must be unshipped before letting go.

NOTE.—A kedge may be hung over the stern of the boat; lashing the ring of the anchor to the stern ring bolt, or after thwart.
(If the masts are in the boat, they may be hung outside, or flung overboard for another boat to pick up.)

How is a stream anchor weighed in a launch?

A davit is fitted over the stern of the boat, resting on the keelson, and well secured with lashings to each quarter. The cable is worked with the help of two luffs. The single blocks are hooked to bolts in the bow of the boat, and the double blocks to a selvagee strop round the cable. One luff is used at a time, and the other is kept overhauled ready. A leading block is hooked in the bow for the fall of the luff to be rove through. If it is difficult to weigh the anchor out of the ground, put one luff on the other. This weighs the anchor, leaving it hanging to the stern of the boat. A pendant secured to the lower part of the shank and led into the boat enables the anchor to be brought much higher out of the water. The pendant may always be kept on the anchor, but before letting go take care to secure the end of the cable, otherwise it could not be reached when required.

(A roller on the stern of the boat, as well as an anchor davit, is always useful.)

To sling a large anchor under a launch by means of the trunks amidships, the flukes being up and down under the boat (Fig. 290A).

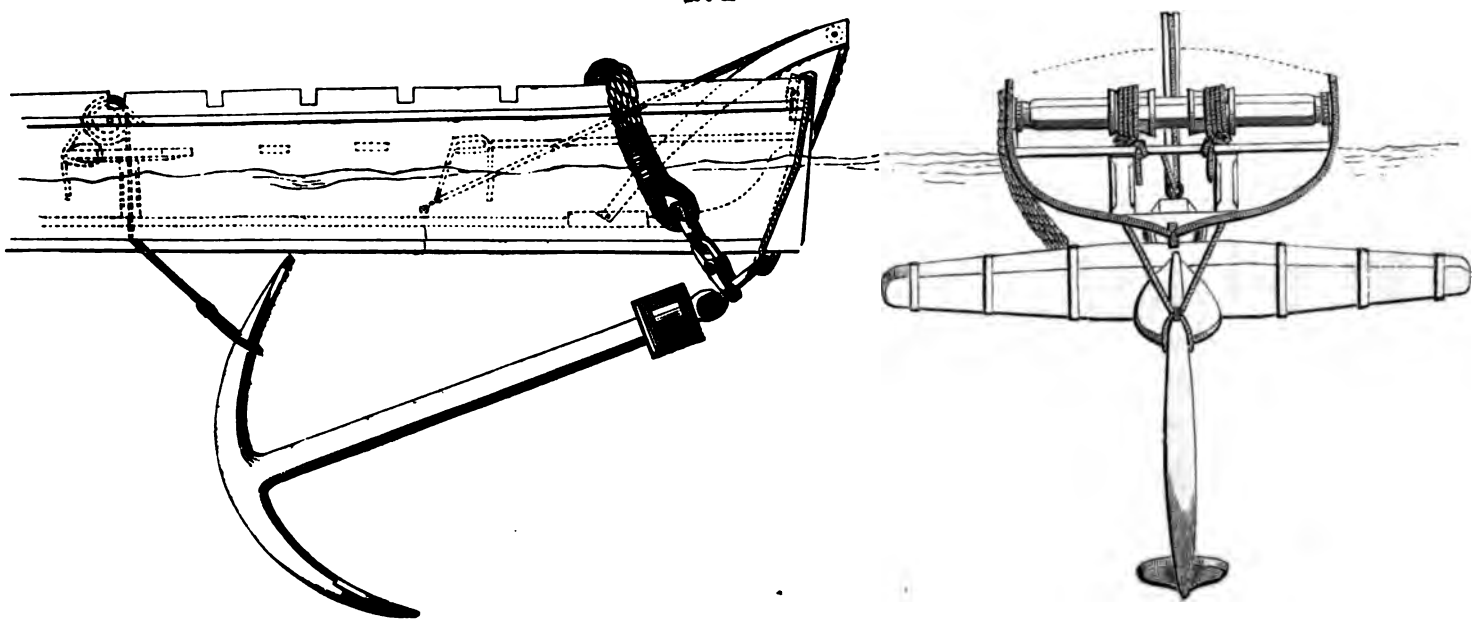
Hook the cat and fish to the proper places, put the stock pendent on, cockbill the anchor, unhook the fish, off stock pendant and ring stopper.

The launch having two good stoppers ready, her windlass, midship trunks, and anchor davit shipped and well secured, is dropped ahead stern first or hauled ahead bow first, according to the sea, and receives the anchor with her bow pointing either ahead or astern.

One stopper having an eye knotted or seized into the bight, is thrown over the fluke of the anchor; pass the two ends up through the trunks, bring to round the windlass, and heave the anchor close up under the boat as the cat is lowered; don't let the shank touch the boat. As the anchor is lowering, middle the second stopper through the ring of the anchor; one end is taken over the roller in the stern, and secured well forward to the double block of a good luff, the single block of which is hooked to the foremost bolt in the bow of the boat; the other is taken over the roller in the end of the anchor

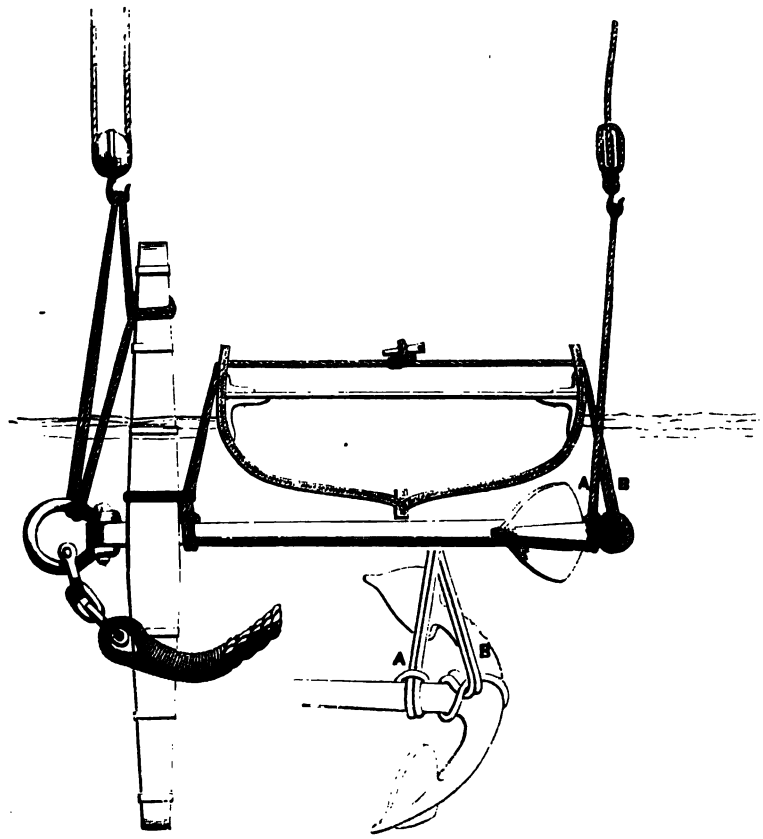
LAYING OUT AN ANCHOR.

290 A



LAYING OUT AN ANCHOR.

290 B



davit, and when the stock is close up under the boat, rove through the ring bolt in the bottom of the boat, and secured with two turns round its own part and two or three turns round a thwart.

A reeving rope is passed through the trunks by dropping a hand lead through and fishing the line outside with a boat-hook, or by forcing a piece of wood through and letting it float to the surface outside.

To let go.

Ease down the luff and midship stoppers to get the anchor well clear of the boat, then, warning the other boats to attend the cable, slip all the stoppers together.

In shallow water the anchor may be eased down until it reaches the bottom.

The after stopper may be fitted to a chain slip shackled to the bolt in the bottom, and slipped from there.

To sling a large anchor under a launch by means of the trunks amidships, the flukes lying horizontal under the boat.

When the anchor is cockbill, hitch the first stopper round the crown and pass the ends up through the trunks as before, middle the second stopper round the upper part of the shank, and pass a strop round both parts and the upper arm of the stock to steady it.

The stoppers are hauled taut, secured, and the anchor let go as before.

An anchor draws less water with the flukes up and down under the boat than when the stock is up and down at the stern; therefore, unless the tide has fallen very considerably, an anchor can always be laid out in this manner.

To sling a large anchor under a launch not fitted with midship trunks (Fig. 290B).

Prepare four 4-inch strops; two are for lowering the anchor and two for securing it under the boat.

The two for hanging the anchor are rove on the bight, one round the crown, and the other round the shank close to the stock being lashed to the upper arm: bend a hauling line to the end of each and let them hang down towards the boat.

The two for lowering the anchor are secured, one to the ring and the other to the shank close to the crown. Hook the cat to the ring strop, which is first hitched round the outer arm of the stock to cant the anchor square, the fore yard tackle to the strop on the shank, and the fish to the

inner fluke. Brace the fore yard forward, top up, and secure it as for hoisting a boat in. Haul taut the cat, fish, and yard tackle. Let go the shank painter. Ease the anchor down by the cathead stopper until the cat has the weight. Let go the cathead stopper, lower of all.

When at the water's edge, let go and unhook the fish, allowing the cat and fore yard tackle to have the weight. Lower away. Haul the boat over the anchor, head to the sea, the shank lying athwartships under the boat. Pass the two strops for hanging the anchor in through opposite rowlocks, as near amidships as possible, toggle one bight through the other, putting a spunyard seizing on the eye to insure the toggle from slipping. Ease up, and unhook the cat and fore yard tackle.

If the anchor has been slung under the boat for exercise, the strops can be fitted the exact length—the anchor being as close to the boat as possible, allowing for a heavy sea. A jigger is hooked to the lanyard of the toggle, which is greased.

When ready for letting go, man the jigger and slip the toggle.

The stock of the anchor being up and down on one side of the boat will prevent the boat being steered straight ahead, but this does not matter if the kedge anchor is laid out to haul the launch off to.

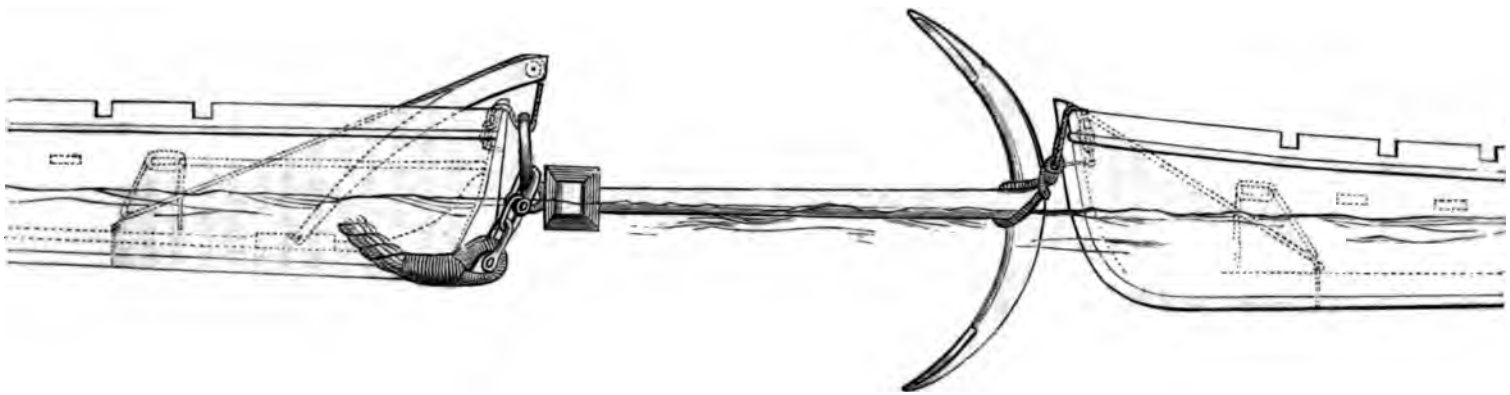
When a ship is on shore forward, unless a launch is fitted with trunks amidships, a large anchor cannot be carried out slung in any position under the boat, on account of the depth of water.

To sling a large anchor between two boats in shallow water (Fig. 290c).

Hook the cat and fish; the cat to the ring, and the fish to a strop round the crown. Put a short strop round the crown, one bight being rove through the other, and a thimble seized in for hanging the anchor by. Haul taut the cat and fish, let go the anchor stoppers, and lower the anchor down nearly to the water's edge. The boats haul up, each having a good stopper for hanging the anchor, and one having the stern davit shipped and secured. The headmost boat with the stern davit secures the stopper to the ring bolt in the bottom of the boat, passes it over the stern roller, through the ring of the anchor, over the roller in the end of the stern davits and secures the end to the luff tackle, which is hooked to the

LAYING OUT AN ANCHOR IN SHALLOW WATER.

290 C



bow ring bolt. Bowse the tackle well taut and secure. Ease up and unhook the cat.

The second boat hauls up bow first, secures her stopper to the ring bolt in the bottom of the boat, passes it over the bow through the thimble in the strop on the crown, in over the other bow and secures the end to a luff hooked to the after stern ring bolt.

Bowse taut the luff, secure and ease up the fish.

If the anchor davit was fitted to the bow of the boat, the anchor would hang quite clear.

To let go.

Ease the anchor down clear of the boats with the luff tackle, then slip the ends of the stoppers together.

Unless fitted with chain slips, there is danger of one stopper slipping before the other, therefore warn the men in both boats to be careful.

Either boat will carry out a considerable quantity of the cable in the opposite end.

How is a bower anchor and the hemp cable laid out by boats?

The anchor must be slung under a launch or between two boats, according to the depth of water under the bows of the ship. The hemp cable is bent to the anchor and buoyed up by all the boats unemployed, keeping the boats well apart, and making those boats that can carry it take one or more coils over the gunwale.

Send a pinnace to lay out the kedge anchor in the direction the bower is to be carried out; take the end of the hawser to the boat or boats with the anchor for them to haul out by.

If it is thought probable that the launch will have to lift the anchor, the buoy rope should be heavy enough to weigh it.

The cable is usually required from aft, therefore pass a hawser from aft forward outside all, in through the hawse hole or port through which the hemp cable is coming out, and bend it to the end.

Before letting go, ease down enough cable to insure the anchor getting to the bottom without running any more out.

The cable can either be paid out in going from the ship or in returning after the anchor is let go.

The anchor can be taken farthest from the ship by carrying the cable out in the boats with a hawser from the ship fast to the end. Haul out to the kedge, drop the bower anchor,

pay out the cable, hauling the boats back to the ship with the hawser.

If this plan be adopted, take care that the anchor is not let go too far from the ship.

How is a bower anchor weighed in a launch?

The buoy rope will point out the position of the anchor—sweep the upper fluke with the bight of a hawser or piece of chain; having caught it, haul the rope the anchor is to be weighed with round the fluke, slip a shackle down both parts to keep it from coming off, pass the ends up through the trunks, bring to and heave up.

When the crown is up to the boat, pass the end of the after stopper from one quarter round the bow and aft the other side, let go the bight forward and it will catch the shank of the anchor, hook on the luffs, and heave the stock up; catch the chain in the same way, and heave it up to another boat.

If the launches have not got trunks, one can support the anchor from the davit aft, but it must be very smooth water. The two launches together might weigh the anchor with two stern davits, each taking an end of the rope and heaving up together.

What is the advantage of lying at single anchor?

Lying at single anchor is much safer than when moored, as the ship is always riding in a direct line from her anchor, no matter in which direction the wind is blowing; the cable therefore receives the strain in the best way. If it comes on to blow, you are enabled to let go your second anchor, and by veering bring them both ahead.

When moored, the cables are never in a line with the wind, except when the ship is exactly between the two anchors, when of course she can only be riding by one of them, the other being of no use.

As the prevailing gales in north latitude commence at S.W. and gradually veer round to the N.W., a ship should, if possible, lie at single anchor with her port anchor down.

When she is obliged to let go her second anchor, she then rides with an open hawse as the wind shifts round.

In southern latitudes the wind veers round the opposite way; therefore, let go the starboard anchor first.

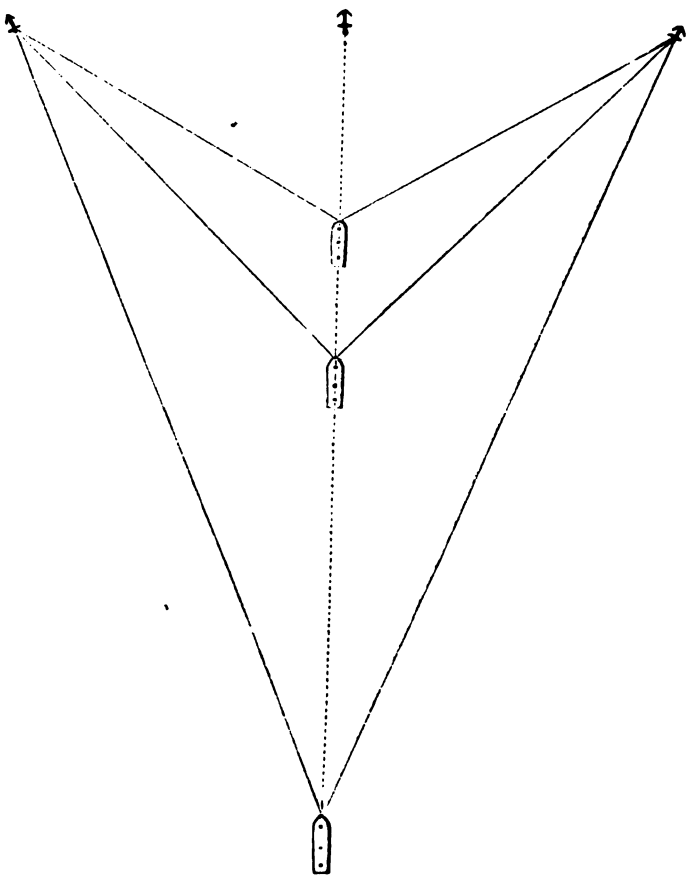
What is the advantage of mooring? (Fig. 290D).

The ship takes up less room in swinging to the tide or wind, as she remains between her two anchors.

The old custom of mooring with open hawse to seaward is a

DISADVANTAGE OF MOORING WITH OPEN HAWSE TO THE GALE.

290 D



SHEET ANCHOR—MOORING SWIVEL.

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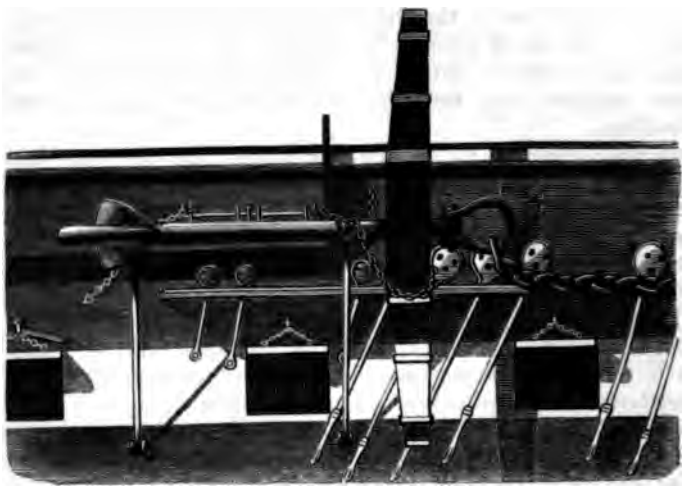

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wrong one—the anchors should be let go in a line with the prevailing wind.

If the anchors are let go in a line pointing to seaward, and a gale comes on in the direction of either of the anchors, the lee one is of no use at first, as it would be under the ship's bottom, but by veering on the riding cable the two anchors are brought exactly ahead into the best position.

In veering, shorten in on the lee cable until the ship has passed the anchor, then veer again.

If the anchors are let go with open hawse to the prevailing wind, and the ship moored with 50 fathoms on each cable, when a gale comes on each cable must be veered to 58 fathoms, to render them together equal in strength to one cable in a direct line ahead, but even then they are only equal to one cable with 29 fathoms out; the ship will therefore have the weight of two cables dragging her bows into the water with this short scope.

To bring the ship 50 fathoms from the line of anchors she must veer 71 fathoms on each cable. With 130 fathoms out on each anchor, the strength of the two cables certainly comes more into play, but she is still only 119 fathoms from the line of anchors.

On the other hand, if the ship is moored with her anchors in a line with the prevailing wind and she veers 130 fathoms, she will then have both anchors in a direct line ahead, one with 130 fathoms out, and the other 30 fathoms. Again, if she drags her anchor at all, she is, by veering, continually bringing her second anchor into a better position ahead, but if moored by the old plan, the positions of the anchors do not alter much for the better.

If a ship had been lying at a single anchor with 50 fathoms of chain out, by letting go her second anchor and veering she brings both ahead, one with 130 fathoms of cable out, and the other with 80 fathoms.

In all cases, after allowing sufficient cable for the ship to ride by, the closer the two anchors are together, the better; taking care in shallow water that the ship swings round clear of the anchor.

To moor a fleet.

The ships must be out of each other's hawse during the prevailing wind.

If the line of bearing of the fleet is in a line with the pre-

vailing wind, that is, if the end ships bear from each other in the same direction as the prevailing wind, the ships will be ahead of each other, or in each other's hawse during the gale.

If the line of bearing is eight points from or at right angles to the direction of the prevailing wind (Fig. 290E), the ships will be abeam of each other during the gale.

Therefore up to eight points, the farther the line of bearing is from the direction of the expected gale, the clearer the ships will be of each other.

It is established that a ship should let go her anchors in a line with the prevailing wind.

If each ship does so, and if the line of bearing is at right angles to the expected gale, the anchors will be at the greatest possible distance apart, and any ship can the more easily come to an anchor, or get under weigh, independently of the rest of the squadron.

It is immaterial whether the lee line moor ahead or astern of the weather line, but the ships should anchor on the bow or quarter of the ships of the weather line, in order that if any of the headmost ships dragged their anchors during the gale they would drift down between the ships moored in the sternmost line.

Use of the mooring board.

In whichever way it is decided to moor a fleet, the mooring board, with a pair of compasses and parallel rules, enables a ship to ascertain the bearing and distance of each of her anchors from a given point.

The admiral's anchor buoys are good guides for each bearing, but the admiral's ship herself is the only true guide for distance.

After the flag-ship has let go her second anchor, if she remains there without heaving in, or if the flag-ship has finished mooring, she would be the best guide for both the bearing and distance.

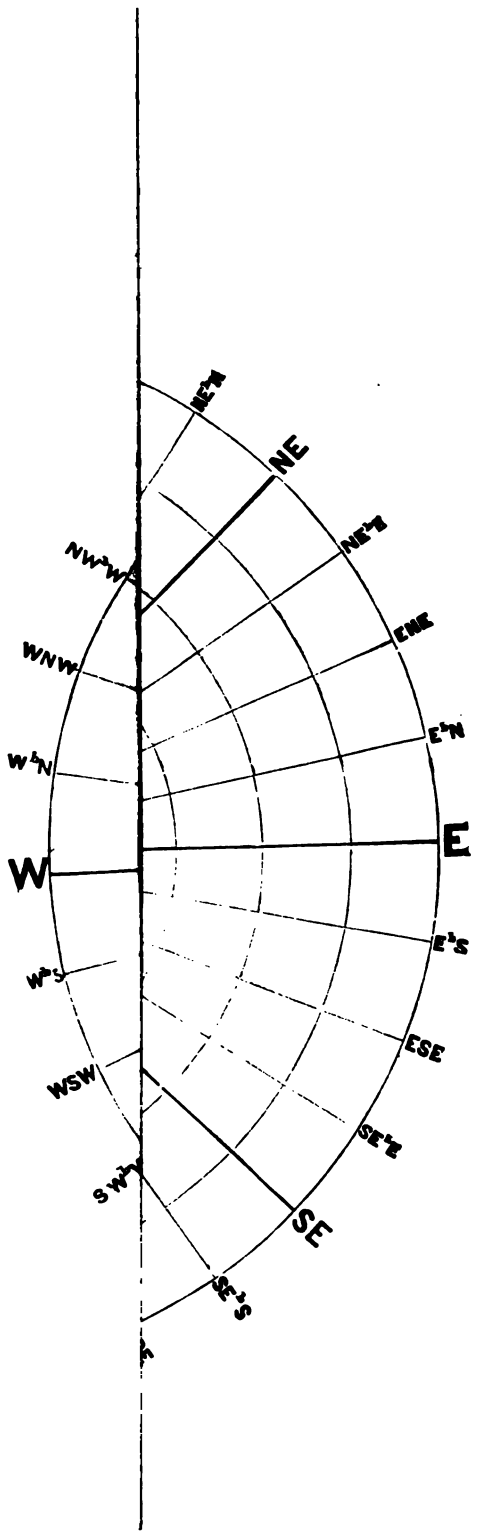
If the admiral is still mooring, his ship not being stationary, the squadron can only have an approximate guide for distance.

The lee squadron should take their own senior officer's ship for their guide.

EXAMPLE.

Supposing the prevailing wind is from the W.S.W.

" The fleet will moor N.N.W. and S.S.E. of admiral, two cables'


NE by N
NE
NE by E
ENE
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ESE
SE by E
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SSW
SW by S
WSW
W by S
W
W by N
WNW
NW by W

length apart. Line of anchors W.S.W. and E.N.E. (or open hawse N.N.W.), seventy-five fathoms on each cable." "Lee line to the westward of the weather line, senior officer W. ½ S. of admiral."

Which causes the least strain on a cable—lying at single anchor, or taut moored with the anchors well on each bow?

Single anchor—as a single rope will bear more weight than two, if the two are taken well apart. They will bear an equal strain when the angle at the bow is 120 degrees.

How is a ship kept from fouling her anchor in a tideway?

By setting a jib, or the spanker, to insure the ship always passing on the same side of the anchor.

What occasions a foul hawse?

Suppose a ship moored with the cables growing one on each bow, if the wind or tide changed to the opposite point of the compass, she must swing round, and in doing so the two cables become crossed; on the next change of wind or tide, if the ship continues to circle round to her first position, an elbow is taken in the cables (Fig. 294), but if she goes round the opposite way the cross is taken out, and the hawse is open or clear again.

How do you clear hawse?

If the foul part is under water, heave in on the riding cable. When high enough, a slip stopper shackled to the stream chain and used in the outer hawse hole, is put on the non-riding cable below the turns, and bowsed well taut.

Veer the non-riding cable, and when slack unshackle it.

Pass the end of a hawser out through the hawse hole, take it round the riding cable in the opposite way to the turn which has to be taken out; pass the end in again through the hawse hole, and bend it to the end of the cable (Fig. 294).

Haul on the hawser, and pay out the cable, assisting it if necessary with the fore bowline. The hawser will bring the end of the cable in again after the turn is taken out.

Shackle the cable, bowse to the compressor. Ease up the stream chain and off slip.

If there is more than one turn, the hawser must be dipped round again.

If there is a cross in the hawse, which anchor should be picked up first?

The under one. If the upper anchor was picked up first, it would hook the cable of the under one.

It is sometimes requisite to pick up the anchor belonging to the upper cable; in that case dip it under, then weigh the anchor.

If moored, and wishing to weigh, which anchor would you pick up first?

Pick up the lee anchor first, or you would foul it and any ships in your way by dropping down too quickly after weighing the weather one.

What is the use of a mooring swivel?

To prevent the ship getting a foul hawse when moored (Fig. 292).

How is a mooring swivel put on?

Put the slip stopper on the riding cable (suppose the starboard), unshackle the starboard cable before the bitts, and put the mooring swivel on, leaving the cup part upwards, bowse to the compressor, off stopper.

Stopper the port cable before all, and unshackle it abaft the bitts; haul the foremost part round into the starboard hawse hole by a hawser, shackle it to the foremost part of the swivel (Fig. 293); off slip stopper from the port cable, then haul the upper part of the port chain or bridle round into the starboard hawse hole, and shackle it to the upper part of the swivel (this gives three parts of chain in the starboard hawse hole); bring to the port chain, heave round the capstan, and veer the starboard chain by the help of the compressor until the mooring swivel is square across the stem. In smooth water, the inboard part of the lee cable may be shackled from a boat, after the swivel has been veered out.

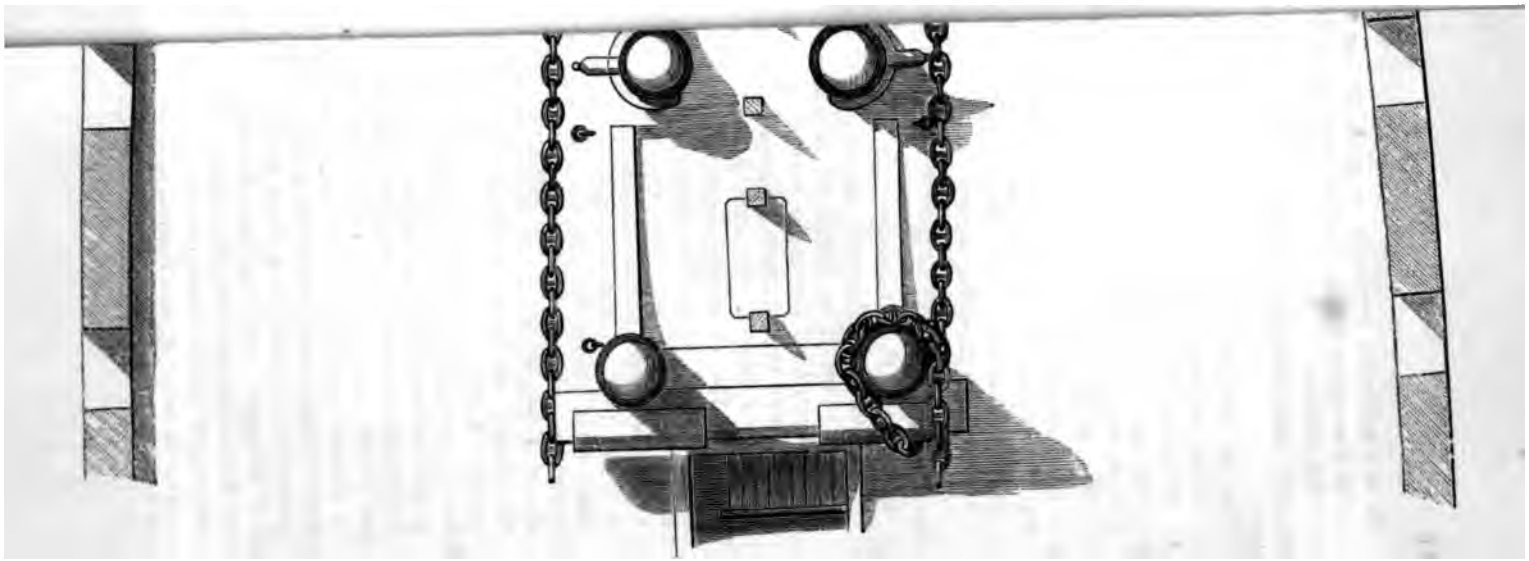
Sometimes only one bridle is used for the ship to ride by; the theory is correct, but then it is only possible to take the swivel off on one side, whereas it might be required to take it off on the other.

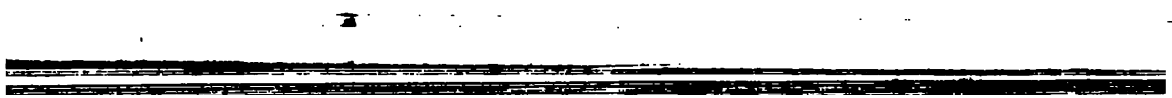
After the mooring swivel is on, it is impossible to alter the angle between the two cables. It does not much matter if the gale comes on in the direction of one of the anchors, as, if only one bridle is bent to the swivel, the cable can be veered and the ship will have the same advantages as when lying at single anchor, except that if obliged to let go another it must be a sheet anchor.

But if the gale comes on in a direction at right angles to the line of the anchors, the ship is riding with her anchors and cables in the worst possible direction.

NOTE.—In taking the swivel off, when the three parts of cable are hove in together, it might be difficult to tell which was the corresponding outboard part of the

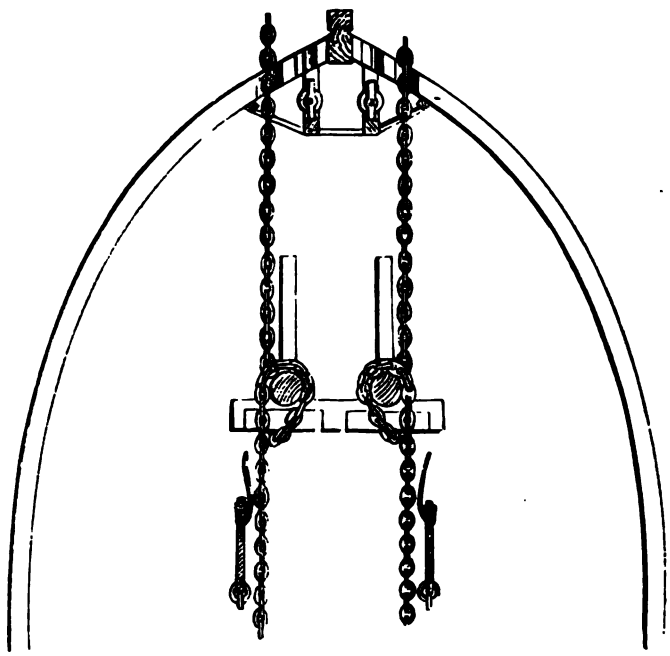
PUTTING A MOORING SWIVEL ON.





CABLES BITTED.

293 B



cable. To prevent this, note when putting the swivel on to which cable either leg is shackled, there being an even number of links on one side and an odd number on the other.

How is a mooring swivel taken off?

It is easiest to take the swivel off on the lee cable side of the deck, but that can only be done in very fine weather.

Bring to the weather cable and heave round, unbitt and pay the chain down into the locker, this will bring the swivel inboard, with the outer or riding parts of both cables and the inboard end or bridle of the lee cable shackled to it; having three parts of chain in the hawse hole, put the slip stopper on the riding part of the lee cable and hang the bridle. Walk back the capstan until the stopper has the strain, then paul the capstan and bowse to the compressor; do not take off the nippers.

Unshackle the two parts of the lee chain from the swivel and shackle them together, taking care there is not a turn in the cable in the hawse hole; bowse to the lee compressor, see the cable clear, "Off Slip." This will bring the lee cable into its proper hawse again.

Put the slip stopper on the weather cable outside the swivel; walk back the capstan, veering on the compressor until sufficient cable is up to allow the swivel to be taken off and the cable bitted, off nippers, unshackle both parts of the weather cable from the swivel and shackle them together, bitt the cable, bowse to the weather compressor, off slip.

In bad weather, the weather cable must not be unbitted.

If the mooring swivel is being taken off for a gale of wind, it may be left on the weather cable and veered out.

In fine weather, if the swivel is being taken off to unmoor, it is a quicker plan to bring it in first on the lee cable side of the deck, disconnect the weather cable, then heave in at once on the lee cable and take the swivel off afterwards. In bad weather this causes a serious jerk to the weather cable, when the bight is slipped from the lee hawse hole, after being unshackled from the swivel.

What is the use of a bull rope?

It is a hawser led through a block on the bowsprit end to the buoy, to keep the boy clear of the stem.

In letting go a sheet anchor, what keeps it from striking against the ship's side?

Two tumblers on hinges projecting up from the ship's side (Fig. 291). When the anchor is let go they throw it off from the ship.

What chain stoppers are there on a sheet anchor?

A slip chain to the upper arm, and a chain strop under the lower arm of the stock, and two chains round the shank secured to a tumbler, which being slipped releases the anchor (Fig. 291).

To re-stow a sheet anchor with the fish davits.

Rig both fish davits (Fig. 283), the foremost one close before the place where the ring of the sheet anchor stows, using a cat block instead of the lower fish block, as it will allow an extra turn to be taken with the fish fall.

Step the other abreast of the place where the balancing point on the shank will come. Rig this after davit with a top block, lashing it in the room of the fish block and leading block. Reeve the pointed end of the toptackle pendant down through the top block, hauling the thimble close to the block; then through a second top block and secure the bight of the pendant round the davit end, leaving the lower top block hanging three or four fathoms down. Reeve and hook the top tackle fall to the thimble in the pendant and a bolt on the opposite side of the deck.

The topping lifts of both davits must be hooked across the deck.

Ease down the fore yard tackle, and pass the lower block forward to take the weight of the chain.

Pull the anchor up to the cathead as usual.

Hook on the foremost fish tackle to the ring of the anchor, and the fore yard tackle to the chain in the hawse hole; haul taut; ease down the cat till the ring is awash, then pull up the fish, ease up the cat; pull the anchor well up.

Lash the top block to the balancing point on the shank, first taking two round turns with the lashing round the shank to prevent its slipping (Fig. 298 B); hook two luffs to strops, one on each arm of the stock; man the top tackle fall and pull the anchor up high enough for placing.

Top the davit up, placing the anchor with a burton from forward or aft as requisite, and the luffs on the stock, which insure its balancing.

The cable must be triced up in the fore chains if it makes the foremost end too heavy.

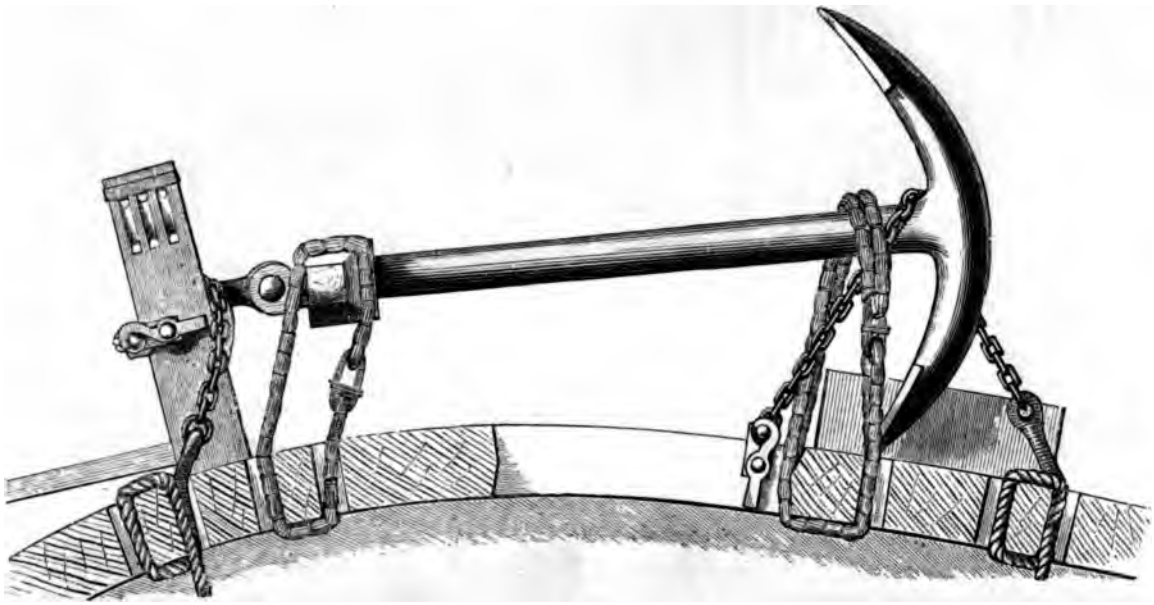
In long bow'd ships or in corvettes, where the sheet anchor is stowed well aft, the drift between the cathead and the foremast fish davit would be too great.

AN ELBOW IN THE HAWSE—CLEARING HAWSE.

294

A BOWER ANCHOR SECURED FOR SEA.

295



In this case, secure a toptackle pendant to the foretopmast head close to the rigging, hook the toptackle to the pendant, which is hauled out as requisite to clear the ship's side by the yard tackle.

Secure the yard with a burton, and if requisite brace it in, take the weight of the anchor with the toptackle and proceed as before.

A burton on the fore yard will take the weight of the cable instead of the yard tackle, which is required to haul the pendant out.

To re-stow a sheet anchor, using a boat.

Rig the after fish davit as before, but the foremost one is rigged in its proper place as usual, cat the anchor, hook the fish to a strop on the crown, pull up, then lower the anchor into the boat with the flukes athwartships, hang the cable with the yard tackle, haul astern, lash the top block as before to the balancing point on the shank, pull up and stow.

If the drift across the deck is not sufficient to take the anchor high enough, the pendant may be led through another top block and worked fore and aft, or a tackle may be rove from the fish davit head.

How is an anchor second-catted?

The catfall, or a piece of rope fitted for the purpose, is rove through a sheave in the cathead, and through the ring of the anchor, two turns being taken and the end secured to the cathead, the anchor is pulled up to its place with the help of a luff tackle.

How is a bower anchor stowed for sea?

It is first second-catted, and the stock brought up and down (with the stock pendant and tackle), two lashings are passed, one round the upper part of the stock and a timber head in the forecastle bulwark, the other round the shank and another timber head (Figs. 295).

Strops are sometimes fitted, being passed round the timber head and the anchor, and then the two bights lashed together.

TO SHIFT A JIB.

Haul the jib down—gather it on to the boom, and put good stops on.

Take the purchase off the jib stay, and bend a reeving line to it.

Unbend the tack lashing, and jib sheets, and bend a rope's end to the clew for an inhaul.

Overhaul the halliards, and secure the bight round the head of the sail, taking care that the lacing may still travel up and down the stay.

"Pull up the halliards," "ease away the downhaul."

When high enough, ease in the jib stay and downhaul, letting the sail come in on the lee side—haul in on the inhaul.

When on the forecastle, unbend the reeving line, unreeve the jib stay from all parts of the lacing; reeve it through all parts of the lacing of the new sail, and bend the reeving line again.

Shift the halliards, downhaul, and inhaul, from the old to the new sail, securing the bight of the halliards round the head of the sail as before.

"Pull up the jib halliards"—haul out on the jib stay reeving line, and jib downhaul.

Lower the jib down to the boom, pass the tack lashing, and bend the jib sheets.

Cast off the bight of the jib halliards, cut the stops—set up the jib stay.

"Hoist away."

If the tack lashing is fitted as a strop and toggle, it is secured round the head of the sail whilst shifting, instead of the jib halliards

The jib pendants are sometimes secured to the clew of the sail with a rope or chain strop and toggle, but usually with a lashing.

TO SHIFT A JIB-BOOM.

Strike the fore top-gallant mast.

Unbend the jib and flying-jib, unreeving the jib stay. If the flying boom iron is fitted with a hinge, the flying-jib stay need not be unrove.

Check the flying guys and martingale; let go the heel and belly lashings; haul out on the flying heel rope. When the heel is clear, "*Ease in.*"

The flying jib-boom with the rigging on it is left alongside the bowsprit, the head resting on one of the bowsprit shrouds or the spritsail gaff.

Ease up the lanyards of the jumpers, guys, and backropes, haul out on the spritsail gaff topping lifts. Haul taut the jib heel rope and take a turn well aft.

Hook the fore topmast staysail halliards to a ring bolt in or a strop round the jib-boom end; haul them taut and keep them manned.

"*Off slips*" of the crupper and heel chains.

"*Ease in,*" pulling up the staysail halliards as the boom comes in.

Use the inner studding sail halliards to steady and lift the heel of the boom over the gunwale.

As the boom comes in, the funnel and rigging are left resting on two iron knees, on the forepart of the bowsprit cap.

Stop the fore topgallant and royal stays to the gib guys.

A jigger on the fore stay is used to steady and lift the head of the boom, shifting the strop out as the boom comes in; or, if great care is taken, the jib halliards may be used.

Land the boom on the forecastle, with the head resting on the hammock netting. Shift the heel rope, inner studding sail halliards, and jigger to the new boom, which has been brought forward whilst the old one was coming in.

"*Haul away the heel rope.*" Attend the inner halliards and the jigger. After the boom is pointed and rigged, hook on and attend the staysail halliards, easing away as the boom goes out.

When far enough out, pass the heel and crupper chains, pulling up the staysail halliards to get the heel of the boom properly down in the saddle.

Pull up the backropes and jumpers.

Haul out on the flying jib heel rope, and secure the boom with the heel and belly lashings. Bend the jib and flying-jib.

Up fore top-gallant mast.

TO SHIFT A TOPSAIL.

Shorten sail as requisite.

Trice up and hook the sail burton round the topmast head.

Unreeve the first and second reef earings from the sail.

Unbend the topsail sheets, clewlines, bowlines, reeftackles, robands, and head earings, securing the bunt robands to the bunt-lines.

Lower the sail down on the weather side by the buntlines.

If blowing fresh, keep fast the weather earing, and bend the weather topmast studding-sail halliards round all parts of the sail, to keep it to windward.

Send up the new sail which has been made up furled with the sail burton before and to windward of the old sail.

When the yard arms are above the top—"high enough."

See the turns out of the sail.

Bend the reeftackles, stopping the hauling part to the head earing, and haul out.

Pass the bunt robands, head earings, and robands—reeve the first and second reef earings.

Let fall when ready.

Haul home the topsail sheets and hoist the sail.

If the new sail is on deck ready, time is gained by gathering the old sail into the top, and sending it down afterwards.

If the furling gaskets are secured to the head of the sail instead of the yard, they are of great assistance in a gale of wind by enabling the robands to be unbent from the yard, leaving the sail furled; then, by hooking the sail tackle to a strop in the bunt of the sail (abaft the topsail yard and lower lift), the topsail may be lowered through the lubber's hole, taking care to have guys from the deck.

If the sail is sent down furled, bend the bight of the buntlines round the quarters of the sail, or keep a strop on each quarter ready to hitch round the sail.

TO SHIFT A TOP-GALLANT MAST.

Send down the royal and top-gallant yards.

Unreeve the yard ropes—top-gallant on the fore side, and royal on the after side, unbending it from the yard.

Let go the top-gallant rigging falls, royal backstays, and jacob's ladder lanyards.

Start and attend backstays and stays, hanging the backstays in the top.

"Sway away"—out fid—"Lower away"—out preventer fid.

Pass the lizard as the head of the mast comes below the cap.

Bear the heel off the topsail yard.

Lower the mast on deck—heel aft, and after side up.

Unsnatch and shift the mast rope and lizard to the new mast, taking care to see it clear of turns.

"Sway away."

Cast off the lizard as soon as the mast-head enters above the topmast trestletrees, then sway it through the top-gallant funnel.

Place the royal rigging and truck, and reeve the royal yard rope —"sway away."

Place the jack and top-gallant funnel—reeve the top-gallant yard rope—"sway away."

Enter the preventer fid as soon as possible—light up all the rigging.

When the fid is entered, "launch."

Steady taut the stays and rigging.

Cross the top-gallant and royal yards.

The snatch for the mast rope must be fitted with a bolt through both parts of the heel, and forelocked in to keep the mast rope from coming unsnatched.

At sea the mast is sent down abaft, and to windward of the topsail yard, and when blowing hard, through the lubber's hole.

A hole is bored in the heel of the top-gallant mast above the proper fid hole, for the preventer fid, as a mast rope frequently carries away in the final pull.

TO SHIFT A TOPSAIL YARD.

Trice up and hook the sail burton at the topmast head.

Take off the quarter blocks and standing part of topsail clew-lines, securing them to the lower cap.

Unbend the sail from the yard, and haul it into the top, overhaul the buntlines well and unbend the reeftackles from the sail, but nothing else.

Hang the hauling part of the reeftackles, studding-sail halliards and top-gallant sheets to the eyes of the lower rigging, to keep them from unreeving at the mast-head, and to have them ready when the new yard comes up.

Trice up the fly blocks with top jiggers, unshackle the tye-blocks from the yard.

Take the tack blocks off the top-gallant studding sail booms, hitching the tack round the strop of the block.

Get the studding-sail booms up and down the topmast rigging with the boom tricing line and top gallant studding sail halliards.

Unsnatch and unreeve the top-gallant sheets and topsail reef-tackle.

Knot the end of the studding-sail halliards and round it up to the jewel block.

Hook the sail burton to the pendant on the yard, which is secured on the quarter with a lizard, mouse the hook.

Attend the topsail braces and lifts, cast off the parrel on one quarter of the yard, and "*sway away*," pulling up on the sail burton.

Unrig the lower yard-arm on deck, and the upper yard-arm in the top (Fig. 297).

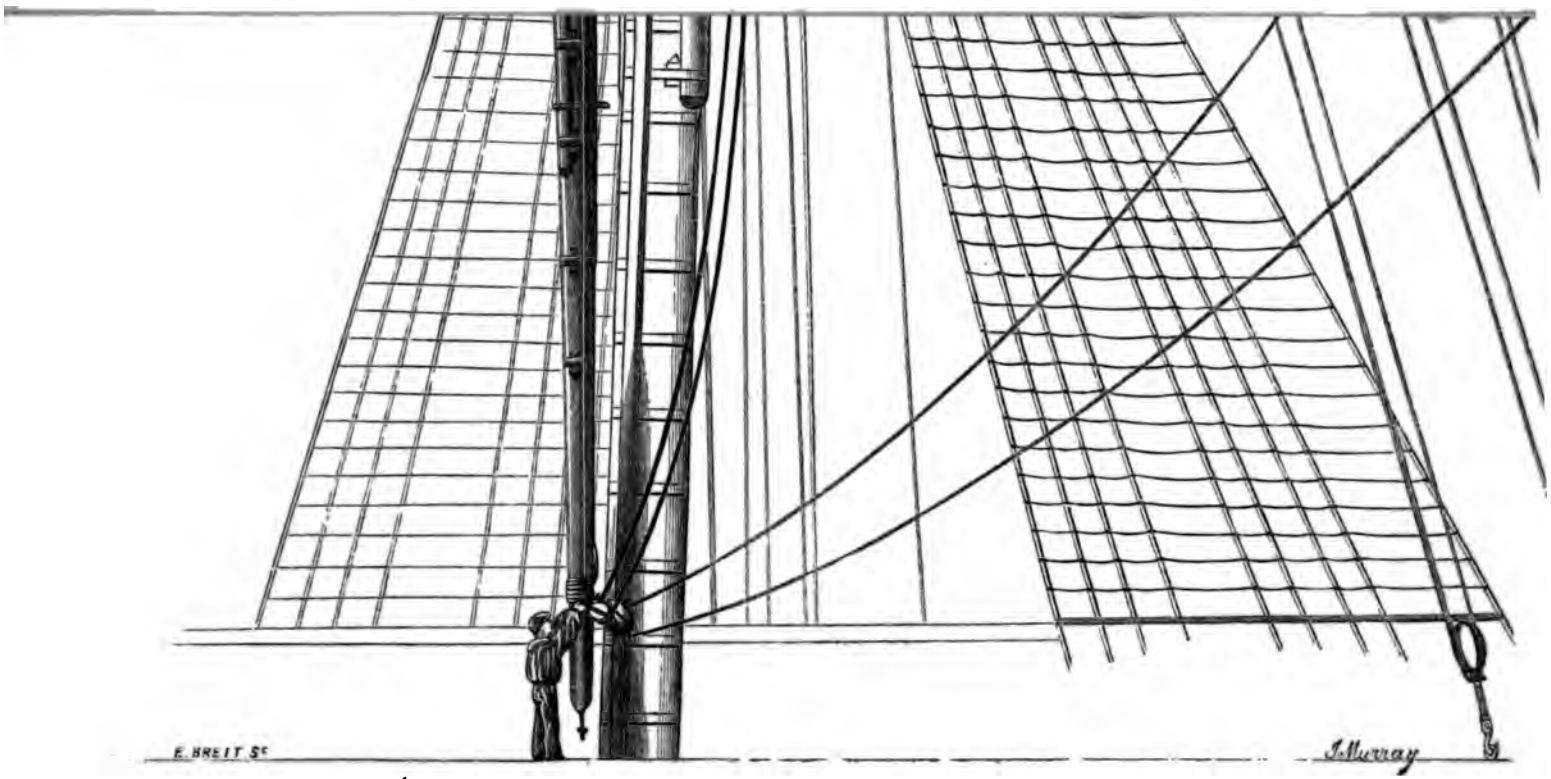
Steady the lower yard-arm well forward, as then the upper yard-arm is kept close to the top for the men working aloft.

Take off the boom irons, flemish horses, jewel blocks, 1st and 2d reef earings, lifts, and braces.

When the rigging is taken off, keep it clear for the new yard.

Lower the yard on deck; lower yard-arm aft, using the main or mizen stay tackle.

Shift the sail burton and stay tackle to the new yard, and "*sway away.*"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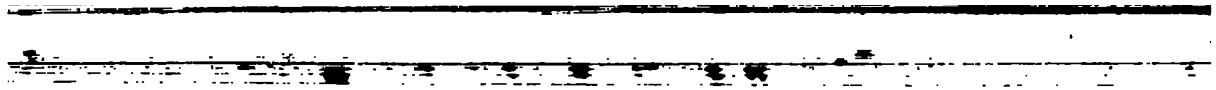
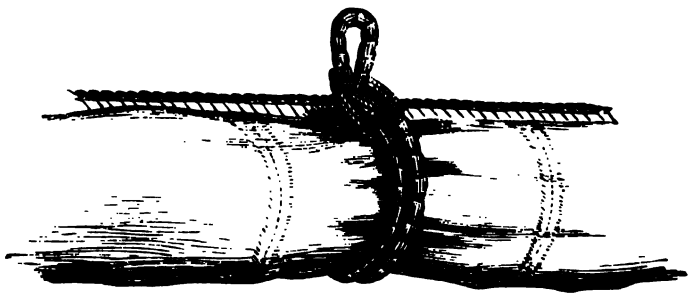
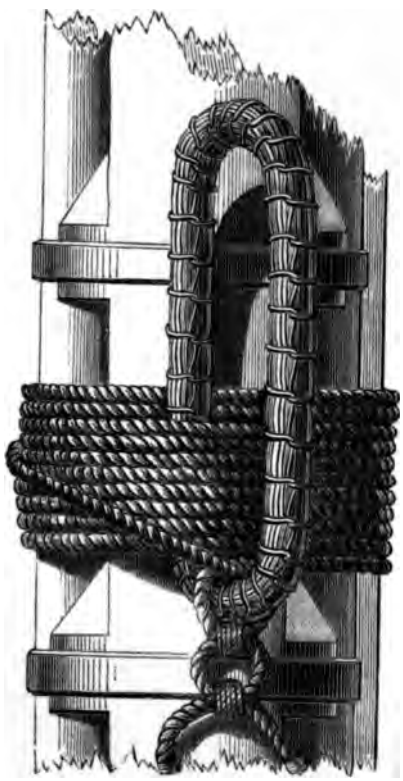


STROP FOR SHIFTING TOPSAILS—GETTING MASTS OUT.

298



298 B



When up and down, rig the new yard as the old one was unrigged.

A bowline bent to the upper quarter of the yard will keep it clear of the fore part of the top.

Attend lifts and braces—"*sway away.*"

With the top jiggers secured on each side of the lower cap, hook the single blocks to the rolling tackle strops. Man and attend them in the top.

As the lizard passes the top, cast off, and let the yard cross itself.

Pass the parrel lashing, and secure the lifts as soon as possible.

Reeve the reeftackles and snatch the top-gallant sheets.

Replace the studding-sail booms and put on the tack blocks.

Secure the quarter blocks, the standing part of topsail clewlines, and shackle the tye blocks.

As soon as the reeftackles are bent, haul out and bend the sail.

Haul home the topsail sheets and hoist the topsail.

If one topsail tye is used to assist the sail burton, cast off the standing part from the topmast head, and bend it round the quarter of the yard, or leave it rove through the tye block and hitched to its own part.

In shifting a yard at sea, send it up and down on the weather side. If possible, take the course in and square the lower yard, but if the course is obliged to be kept set, hook a top burton from the topmast head to the weather lower yard-arm for a preventer lift—then let go and overhaul the lower lift to clear it of the yard.

(After crossing the new yard, if the bunt has fallen to leeward, or does not rest fairly on the cap, and consequently will not allow the parrel to be passed tautly at once, use a rolling tackle to haul the yard over to windward.)

TO SHIFT A TOPMAST.

Up one toptackle pendant and fall, the jears, and a large hawser.

Reeve the toptackle pendant in the dumb sheave and the hawser in the live sheave, first reeving it through a thimble fitted on the hauling part as a lizard, with two good tails.

Send the royal and top-gallant studding-sail yards down out of the top. Any ropes or whips which may be wanted must be hung from the top rim, to prevent them getting under the topmast rigging as the mast comes down. Hang all the backstays abreast the top.

Down top-gallant yard and mast, sending them both on deck.

Secure the top-gallant and royal funnels, and the truck on the fore part of the crosstrees.

Secure the top-gallant studding-sail booms and the bunt of the topsail to the topsail yard, bend one of the top bowlines to the centre, cast off the parrel on one side—attend the topsail halliards, braces, and lifts—haul forward on the bowline. Let go the reeftackles and top-gallant sheets, and when clear of the lower cap, lower the topsail across the fore part of the top, lashing it there. Clear away the topmast rigging, backstays, and stays, starting all the lanyards, except one stay and the weather backstays, which are attended as the mast is swayed. Man the top-tackle fall—take a turn with the hawser. Let go the topsail halliards and lifts and all the ropes that go to the topmast head, "Sway away"—out fid—"Lower away." Man the top-gallant mast rope to assist the mast down, overhauling the toptackle fall as requisite. Brace up the lower yards—the main on the starboard, and the fore on the port tack; overhaul the trusses, and, if necessary, unshackle them and trice the bights up by a rope led down through the lubber's hole.

When the fairleader hoop for the top-gallant rigging is a little above the lower cap—stopper the hawser. Cast off the standing part of the toptackle pendant and unreeve it, hanging the upper toptackle block to be ready for the new mast. Take off the fairleader hoop, haul the hanging blocks and the topmast rigging taut out under the crosstrees. Put bell-ropes on the crosstrees to steady them.

Secure the hawser for surging the topmast to start the crosstrees off the mast-head. If the crosstrees are six feet above the lower cap, about three fathoms of the hawser will be required. See the capshore secured in its place and all the men clear.

Let go the stopper on the hawser. Surge the topmast.

If the crosstrees hang the mast—take the hawser to the capstan—heave the mast up and surge again as before.

When the mast-head is clear, secure the topmast crosstrees, funnel and cap on top of the lower cap. Pass the two tails of the lizard round the topmast, *below the hounds*, taking two round turns with each tail and then knotting them together—hang it with a small rope from the topmast head to keep it from slipping down.

Lower the topmast with the heel down the hatchway before the mast until the head is clear of the trestletrees. Bend the end of a whip round the masthead and haul forward; when the head is before the top rim, heave round the capstan. Hook a burton from aft to the heel; when the heel is above the coaming of the hatchway, haul aft the burton, lower the hawser and land the mast on deck.

Lash a runner block on the fore side of the new mast two-thirds up. Reeve the jears through the jear block at the masthead, and the runner block on the topmast, secure the standing part by taking a half-hitch round the topmast above the runner block and securing the end through the fid hole to prevent the lashing slipping up. Unreave the hawser from the old mast and shift the burton from the old to the new one.

Man the jears, and walk the new topmast up, with the head pointing before the top. Lower the heel down the hatchway, slue the mast round with the fore side forward, point the mast and land it on the deck, lighting up all the gear well. Cast off the jears. Reeve the hawser and heave the mast up. As soon as the heel is above the lower yard, square the yard and haul taut the trusses to catch the mast if anything carried away. Reeve the toptackle pendant and fid the mast with the toptackle fall and hawser; set up the rigging. Sway up the topsail yard, fid the top-gallant mast, and cross the top-gallant yard.

At sea, the after backstays and the stays must have luffs on, and the slack taken in as the mast is lowered. In going up they must be eased off.

MECHANICAL POWERS.

How is the power gained by a tackle calculated?

It depends upon the number of the parts of rope in the moving block. Thus, with the single block of a luff

three times the power is gained, and with the double block four times (Fig. 180).

How is the power gained by a lever calculated?

It depends upon the relation of the long arm to the short one, reckoning from the fixed point. If the long arm is twice as long as the short one twice the power is gained, and so on—therefore, the longer the long arm, and the shorter the short arm is, the greater the power.

How is the power gained by a wheel and axle calculated?

The wheel and axle is only a continuous lever, the half diameter of the wheel being the long arm, and the half diameter of the axle being the short arm—therefore, the longer the capstan bars, and the smaller the barrel of the capstan, the greater the power.

How is the power gained by an inclined plane calculated?

It depends upon the relation between the length of the inclined plane and the thickness. Thus, a wedge four times as long as it is thick gains four times the power, independent of the blow of the hammer used.

How is the power gained by a screw calculated?

The screw is only a continuous inclined plane, the length being measured once round the screw, and the thickness or pitch being the distance between each thread—therefore, the closer the threads are the greater the power.

Any one of these powers may be used in combination with another, thus multiplying the power gained.

Whenever power is gained there is a corresponding loss of time.

(Friction has not been considered).

MANŒUVRING.

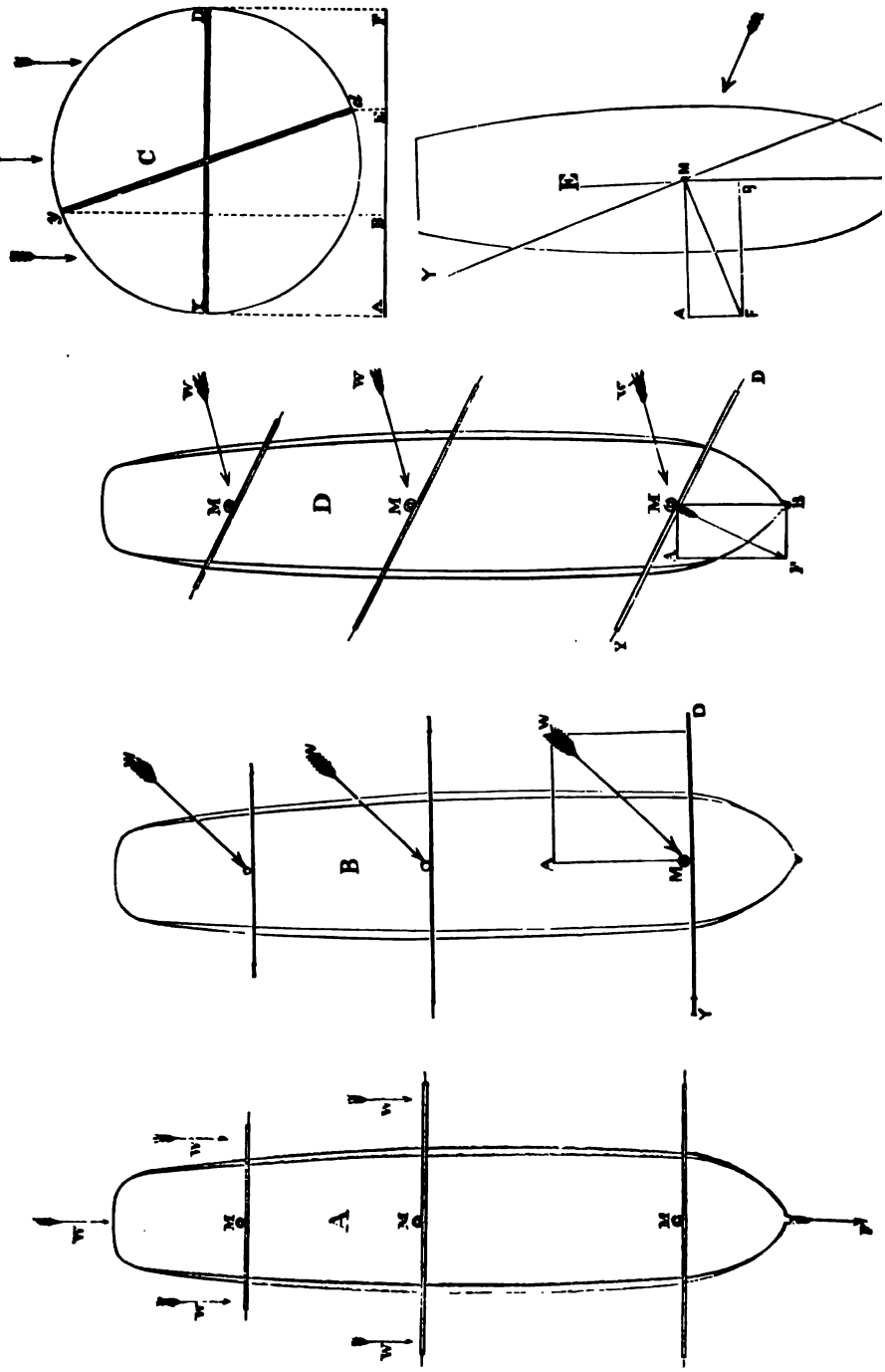
When the ship is going ahead, if the helm is put to starboard, how will the rudder act?

It will send the ship's stern to starboard, and therefore her head to port.

When the ship is going astern, if the helm is put to starboard, how will the rudder act?

It will send the ship's stern to port, and therefore her head to starboard.

SHOWING WHY A VESSEL MOVES FORWARD UNDER SAIL.



Supposing the wind to be abeam, and the fore topsail alone to be set, what effect will it have on the ship?

It will send the ship ahead, and her bow to leeward, or away from the wind.

Supposing the wind to be abeam, and the fore topsail to be set aback, what effect will it have on the ship?

It will force the ship astern, and her head to leeward, or away from the wind.

Supposing the wind to be abeam, and the mizen topsail alone to be set, what effect will it have on the ship?

It will send the ship ahead, and force her stern away from the wind, bringing her bow to windward.

Supposing the wind to be abeam, and the mizen topsail to be set aback, what effect will it have on the ship?

It will force the ship astern, and her stern away from the wind, bringing her bow to windward.

Supposing the wind to be abeam, and the main topsail (being in the centre of the ship) alone to be set, what effect will it have on the ship?

It will force the ship ahead only.

Supposing the wind to be abeam, and the fore and mizen topsails alone to be set, what effect will it have on the ship?

They will balance each other, and send the ship ahead.

Supposing the wind to be abeam, and all three topsails set with no rudder, how would you trim the sails to keep the ship away, or force her bow away from the wind?

Take away the main and mizen topsails by bracing in the after (main and crossjack) yards, thus making the wind blow against the edge and along the surface of the sail, without having any direct pressure on it, leaving the fore topsail to send her bow to leeward.

What is the use of bracing in the main yard as well as the mizen?

Because the sails on the main mast must be reckoned as acting abaft the centre of rotation, the body of the ship being so much larger forward than aft.

Supposing the wind to be on the quarter, how would you trim the sails if you wished to bring the ship nearer the wind?

By bracing up the after yards, and setting the spanker.

WHY A SHIP MOVES FORWARD UNDER SAIL.

In fig. (*a*) 299 the sails are spread athwart-ships (or exactly across the ship); as the wind blows straight against

them, the whole force exerted will be to send the ship ahead away from or before the wind, in the direction MF.

If the wind is not exactly astern, but on either quarter, as in fig. (*b*) 299, she will still be forced ahead in the direction MF.

Were sails nothing more than a collection of bags the force would be exerted in the direction the wind was blowing. But on the wind striking against a flat surface, the motion imparted is in a direction at right angles to the part struck.

Let YD represent the sail of a ship, WM the direction and force of the wind. It is clear that this force would be equal to and have the same effect as two other forces, DM and AM, both pressing at the same time; on a sail the force DM can have no effect, blowing as it does along the surface, leaving AM to exert its force alone, always in a direction at right angles to the part struck, that is, to send the ship ahead.

When the wind strikes a sail obliquely it has not so much effect as when striking it at right angles.

In fig. (*c*) 299 YD represents a sail with the wind blowing against it at right angles, and *yd* a sail with the wind blowing obliquely against it. AF will represent the number of particles which strike the sail YD, and BE those that strike *yd*, therefore AB + EF will represent the number which are lost on *yd*.

To gain as much power as possible the sails are fitted to turn the surface more facing the wind, as in fig. (*d*) 299.

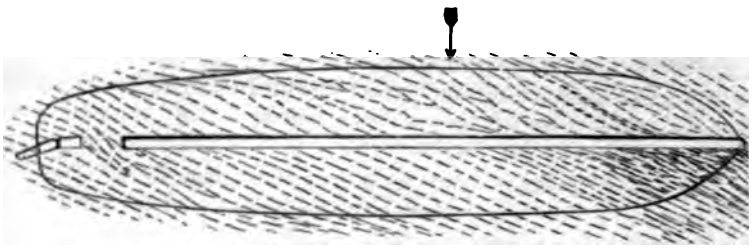
But directly the plane of the sail is thus moved, the direction in which the ship is forced, MF, is also moved, and ceases to be in a line with the keel or straight head.

Were a ship exactly round she would be forced in a direction at right angles to the sail (or MF, fig. (*d*) 299), but in consequence of the wedge-like form, she is forced in two directions, straight ahead and sideways. There is so much resistance against her going sideways, on account of her great length and depth, and so little against her going forward, that as long as the wind is kept on the after side of the sail, she may be steered forward in a direction actually approaching the wind.

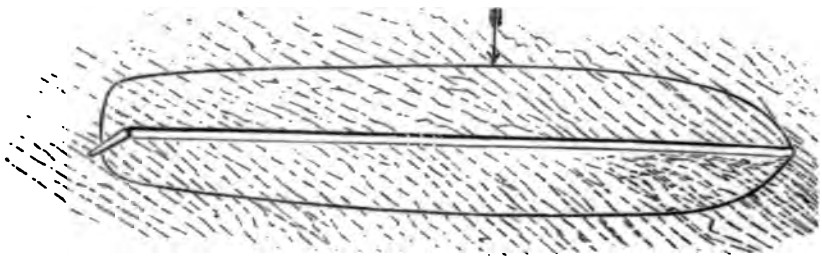
In fig. (*d*) 299 let MF represent a line at right angles to the sail YD, therefore MF represents the direction in which

SHOWING WHY A SHIP CARRIES WEATHER HELM.

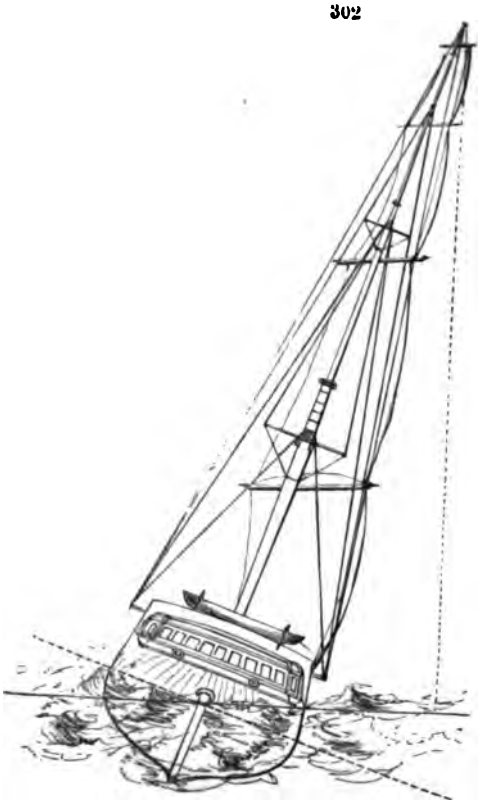
300



301



302



the ship *would be* forced were it not for her peculiar shape.

The force MF has the same effect as, and is equal to, the two forces MA and MB, MA representing the sideway motion, and MB the forward motion.

But the ship is built in such a way that the force MA can scarcely be exerted in consequence of the resistance offered. At the same time the sharp wedge-like form of the bow offers comparatively little resistance against the force MB.

The result is that the greater part of the force exerted is in a direction to send the ship ahead, and the sideway motion is a very small fraction of the whole.

In the same manner it may be shown in fig. (*e*) 299, that with the wind before the beam, as long as it blows against the after side of the sail. the ship is still forced ahead, the speed decreasing as the plane of the sail is brought nearer to the line of the wind.

NOTE.—A ship will have as much leeway as headway, when the side pressure AM bears the same proportion to the headway MB, as the resistance offered by the length of the ship does to the resistance offered by the breadth or bow.

ADVANTAGE OF SAILS BEING SET AS FLAT AS POSSIBLE.

The force exerted is always at right angles to the part struck (p. 158).

If an infinite number of horizontal lines are drawn to leeward at right angles to the surface of a square topsail, those drawn from the weather half will point further forward than those drawn from the lee half, some of which will point directly abeam, and some even abaft the beam.

Therefore the force exerted by the wind blowing against the weather half of the sail has more effect in sending the ship ahead than the force exerted against the lee half, part of which is producing only leeway, not sending the ship ahead at all, and part actually forcing the ship astern.

The advantage of a balloon jib is that it has little or no horizontal, although it has considerable perpendicular curvature. Having little horizontal belly, the force exerted by the lee half is nearly in the same direction as that exerted by the weather half.

With a sail set perfectly flat by being laced to booms, the force exerted by any part of the sail is in the same direction as that exerted by any other part.

WHY A SHIP CARRIES WEATHER HELM.

As a ship passes through the water the wind presses her sideways to leeward, the water, therefore, instead of coming from forward straight against both bows, is forced against them from the lee side, thus acting more directly against the lee bow than the weather one, presses the lee bow to windward (Fig. 301).

As a ship heels over to leeward the shape of the body in the water alters considerably, the lee bow being larger, and the weather bow smaller; the lee bow, therefore, having a greater surface exposed to the water, is pressed by it to windward, whether the ship has leeway or not (Fig. 304).

If the masts of a ship are upright, the wind striking the surface of the sail exerts its force in a line at right angles to the surface, or in a line with the horizon; as the ship heels over this line must alter, and therefore each square sail becomes a depressing sail, pressing the bow into the water, which having more surface to act against, presses the lee bow up towards the wind.

As a ship heels over, the pressure of the wind on the sails which are forcing the ship ahead, is brought to leeward of the line of keel, and therefore the force exerted is all on one side of the ship (Fig. 302), which consequently turns the bow to windward in the same way as the oars on one side turn a boat.

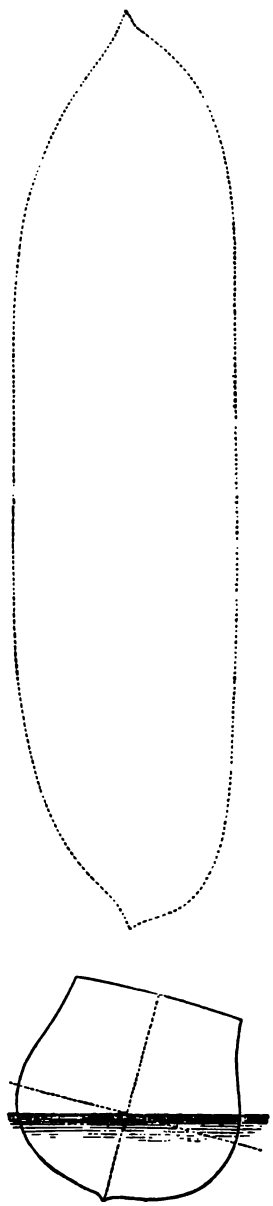
As the ship heels over this turning power increases, as the leverage of each sail is lengthened.

It is found by practice that with a ship heeling over about 12°, the turning power of the sails on the foremast, together with the depressing power they have on the lee bow, counteracts and is more than the leeway or side pressure of those sails; consequently, with a ship carrying a strong weather helm, it is advisable to take in the fore top-gallant sail, or a reef more in the fore topsail than in the main.

The main top-gallant sail is of course exerting its power further outside the ship than the fore, but the fore is taken in in

FORM OF A SHIP'S BOTTOM IN THE WATER WHEN HEELING OVER.

304



preference, in the same way as the bow oar of a boat would be laid in in preference to an after one.

All these forces increase as the wind increases, therefore in a squall it is very difficult to keep a ship away from the wind, even if the after sails are taken in.

Why a screw ship carries more weather helm than a sailing ship.

When a ship with a screw aperture (Fig. 300) is pressed sideways by the wind, the water running along the lee side of the bottom of the ship finds an opening in the after part, which, offering no resistance to it, allows the stern to be forced sideways to leeward more than the bow; to counteract this, the helm must be put more to windward, to keep the bow out of the wind.

Again, it is not only the water which strikes against the rudder that turns a ship round, the water on its passage aft along the bottom of the ship being checked by the rudder, checks the water behind it, which therefore exerts a force on the after part of the ship for a considerable distance before the rudder.

In a screw ship this is totally lost in consequence of the short stern-post.

Why a screw ship is harder to tack than a sailing ship.

In tacking, as long as a sailing ship has headway, the water coming along the weather side of the bottom strikes the rudder and assists to turn the ship; but in a ship with a screw aperture the water meets a constant current coming from the lee side through the screw hole, caused by the leeway the ship is making and the side movement of the stern, and is consequently carried off with it to windward at a considerable angle from the line of keel, without touching the rudder at all.

In tacking a screw ship after the rudder is put down, if the helm is let go, it will remain stationary, showing that there is no pressure on it to turn the ship, therefore all screw ships are tacked by other means than the rudder.

The rudder to be of the utmost use must receive the direct impact of the water before the direction of the stream is altered by running through the screw hole.

If two rudders were fixed one on each side of the run, before the screw aperture, or if the screw aperture were filled in when sailing, the water would act against the rudder to steer a screw as easily as a sailing ship.

Two rudders might be fitted, hanging on a post on each side of the body post: they would fill up the screw

aperture when sailing, being used as rudders or not as requisite, and when steaming they could each be turned forward forming close against the run of the ship.

Why the weather brace has more strain than the lee brace.

If yards were pivoted in the centre of the mast, the weather and lee sides of a sail would balance each other, and the yards would remain stationary at any angle at which they were placed with regard to the wind, but directly the yard is removed from the centre of the mast, and pivots at a certain distance from it, although the effect produced is at right angles to the plane struck, the wind is also exerting its force to blow the whole sail onwards into a direct line away from the support or mast.

The two sides will again balance each other when the centres of the yard and the mast are in a line with the direction of the wind.

If the yards are not allowed to take this position (which is never the case except with the wind right aft) the strain on the weather brace is greatly increased, and the strain will increase as the distance between the yard and the mast increases, therefore the yard should be trussed close to, to lessen the strain on the weather braces.

When it is blowing hard, take great care in easing a weather brace.

Why the upper yard may be braced more in than the lower yards, when the ship is on a wind.

The lower yards of a ship are braced up to about an angle of 20 degrees with the fore and aft line, but the weather half of the topsail is at a much larger angle on account of the curvature of the sail. Large sails have more curvature than small ones; a large sail must therefore have its yards braced up to a sharper angle than the yards of a small sail for the plane of both sails to be at the same angle with the fore and aft line.

Again, the upper part of a sail, from being attached to the yard, has not so great a curvature as the lower half, therefore the upper yard of the upper sail may be braced in more than the lower yard of the upper sail.

TO TACK A SHIP.

"*Ready all.*" "*Ease the helm down.*" "*Haul over the boom*" amidships. "*Helm's a lee,*" the head and fore sheets are let go. When the sails are shaking, "*Raise tacks and sheets.*" "*Let go the top-gallant bowlines.*" *Haul well*

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taut the main brace." When the wind is a point and a half, or a point from the bow, according to the force of the wind, "*Mainsail haul.*" As soon as the bow is past the wind shift over the head sheets. Set up the weather after-backstays. As the bow falls off man the "*head braces,*" and when the after sails are filling, let go "*head braces,*" "*Off all haul.*" "*Right the helm.*" After the head yards are braced sharp up, "*Brace up the main yard.*" Haul taut the weather lifts and trusses. "*Haul the bowlines.*"

If a ship has lost her way through the water, the main yard must not be hauled until the wind is right ahead.

(The time to "*Right the helm*" depends upon the speed of the ship through the water; but if the ship loses her way altogether, the helm should be "*Righted*" immediately.)

USE OF EACH ORDER GIVEN IN TACKING A SHIP.

"*Ready all*" . . . To insure every one being in his station.

"*Ease the helm down*". To the quartermaster, who should not put the helm down too suddenly.

"*Haul over the boom*". . To haul the spanker boom amidships, in order to force the stern to leeward, and consequently the bow nearer to the wind.

Pull up the lee boom topping-lift, and let go the weather one.

"*Helm's a lee*" . . . . Directly the helm is down, the head and fore sheets are let go, in order to take the wind out of the jibs as soon as possible.

In a light breeze, or tacking against a heavy head-sea, the head sails are hauled down, and the lee fore-brace checked a little to insure the fore topsail taking aback.

The head braces are frequently checked in tacking, but the sharper the yard is braced up the more effect the sail will have to turn the bow round when the sail is once aback.

(After letting go the fore sheet, do not allow the lee fore-tack to be shortened in too soon, as it would make a back sail.)

"*Raise tacks and sheets*" The wind being out of the lower sails, the clewgarnets are pulled up high enough to allow the tack and sheet blocks to swing round with the sail clear of the hammock netting. The lee tack and weather sheet are shortened in as much as possible.

(The weather fore-clewgarnet should not be raised until just before the head yards are braced round.)

"*Let go the top-gallant bowlines*" . . . . To insure the bowlines of the light sails not being kept fast whilst the after yards fly round.

"*Haul well taut the main brace*". . . . . A caution to the men on the main brace, and those attending the lee after-braces, maintop bowline, top-gallant braces, and main brace tricing line, to have their ropes well clear and ready for letting go.

"*Mainsail haul*" . . . The lee after-braces and the bowlines are let go, the after yards braced round, and the mainsail set on the other tack.

"*Head braces*" . . . . To caution the men to come from the main tack and sheet, etc., to the weather head-braces.

"*Of all haul*" . . . . The lee head-braces and head bowlines are let go, the head yards braced round, and the foresail set on the other tack.

"*Brace up the main yard*" Were the main yard braced sharp up at once, in tacking, it would lock the fore yard; the tack also comes down easier when the yard-arm is exactly over the tack block than it will when the yard is braced sharp up; therefore it has to be braced up afterwards.

In tacking, why does the main yard fly round by itself if hauled before the wind is ahead?

Because the head yards becalm the lee side of the main topsail, but not the weather side, which is still aback; therefore, the wind acting only on the weather side, will

blow that side aft, and consequently the lee side forward; if the yard is not hauled until the wind is passed the bow, then the weather side is becalmed, and the lee side is full of wind, the sail being aback, therefore it cannot come forward by itself.

(If the main yard is to be left square, do not haul it quite so soon.)

In tacking, if the ship misses stays, what is to be done?

Either fill on the same tack and try again, or let her go round on her heel.

TO TURN A SHIP ROUND ON HER HEEL AFTER MISSING STAYS.

As soon as it is certain that the ship has missed stays, and whilst her head is going off from the wind, "*Haul aft the head and fore sheets,*" "*Up mainsail,*" "*Brail up the spanker.*" As the wind comes on the bow and shakes the sails, "*Square the after yards,*" and as the wind draws aft, "*Brace up the after yards*" on the other tack, "*Set the mainsail,*" and "*Square the head yards.*" When the wind is on the other quarter, "*Set the spanker,*" shift over the head sheets. As the wind comes forward, brace the fore yard forward, keeping as little wind in the head sails as possible without shaking them. When the wind is abeam, "*Brace sharp up.*" Haul aft the head sheets.

TO "BOXHAUL" AS SHORT ROUND AS POSSIBLE.

Luff the ship up into the wind, keeping fast the head sheets. As she is losing her way, and coming head to wind, "*Brace round the head yards,*" aback, up mainsail and spanker, "*Square the after yards*" and let her head fall off from the wind—trimming all the sails as before.

In a light breeze, the rudder may be used whilst the ship has sternway; but if it is blowing, it must be secured amidships with the twiddling lines, as there would be too much strain on the pintles and braces.

If blowing hard, take great care when easing the weather head-braces as the yard goes forward; as the wind, acting more on the weather half of the sail than it does on the lee, blows the yard forward by itself (page 162).

TO WEAR.

"*Put the helm up,*" "*Brail up the spanker,*" "*Up mainsail,*" "*Let go the after bowlines,*" "*Man the weather after-braces.*" As

the ship's head "falls off," round in the after braces gradually, keeping the sails just lifting, until the after yards are square. When nearly before the wind, raise fore tack and sheet, let go the head bowlines—"*Square the head yards.*"

When before the wind, shift over the head sheets, "*Brace forward the after yards,*" "*Set mainsail*" *and* "*spanker.*" As the wind draws abeam, "*Brace up the head yards,*" "*Haul aft the head sheets.*"

The time to right the helm depends upon the ship; but take care not to let her come into the wind after she is round.

If blowing hard, be very careful to man the lifts and trusses, and rolling tackles as the yards are being squared; and in bracing forward, have a good turn whilst easing the weather braces.

If a ship comes up to the wind through bad steerage or otherwise, how will you get her head off again?

First try by flattening in the jib sheet; if that will not do, brace round the head yards, which will send her head off away from the wind.

How will you trim and make sail for casting, if you wish to sail close hauled on the starboard tack or cast to port?

When the cable is at a "short stay," set the topsails, trim the after yards on the starboard tack, and the head yards on the port tack. As soon as the anchor is out of the ground, the fore topsail will send the ship astern, and her head to leeward; hoist the jib as soon as it will take; brace round the head yards, and set the spanker as soon as the after sails are beginning to fill.

How will you trim sails for casting if you wish to run before the wind?

To bring the ship's head round as soon as possible, trim and proceed as before, for the after sails being aback, will send her stern to windward. As the after sails fill, brace in the after yards; when the wind is nearly abeam, brace round the head yards, and when before the wind square all the yards.

In a squall with a square-rigged vessel, "keep away." The sails must not be got aback by luffing, as the ship would be unmanageable.

In a squall with a fore-and-aft rigged vessel or boat, check the sheets and "luff."

If a ship is in irons, "up mainsail," square the main yard, and manœuvre with the other sails.

TO UNMOOR AND PROCEED TO SEA.

When not tide rode, pick the lee anchor up.

If there is a cross in the hawse with the lee cable on top, it must first be dipped under the weather cable, or the anchor would hook the cable; if the lee cable is under, it will come up all clear.

If the weather anchor were picked up first, directly it was out of the ground, the ship would drift to leeward past her lee anchor, most probably fouling it, but certainly bringing a severe jerk on the cable; the ship would also take up more than her own share of the anchorage.

Picking up the weather anchor last, enables the ship to start further to windward than if she started from her lee anchor.

If the ship is tide rode, either anchor may be picked up, helping the ship with a sail as requisite.

Bring to the lee cable, rig the fire engine, passing the hose out of the spare hawse-hole, pass the nippers, *heave round the capstan* and unbitt. Veer away on the weather cable so as to bring as little strain as possible on the lee one. Pick up the lee anchor. Bring to the weather cable and heave in to a long or short stay as requisite.

In heaving in, the cable and messenger are placed on top of the arm of the bitts, in order to keep them off the deck, and the turns of the nippers clear.

Cross top-gallant and royal yards.

This may be done before or whilst unmooring. The fore and mizen top-gallant and royal yards are generally sent up on the port side, and the main on the starboard side.

The top-gallant yards are swayed up before all from their places up and down the lower masts, or secured to the foremost shroud of the lower rigging.

The royal yards are swayed up from the topmast rigging, generally abaft all until they pass the crosstrees, the

object is to keep the two yards and the men attending to them clear of each other. As soon as the yards are across, "*Bend the top-gallant and royal gear.*" "*Put the jewel blocks on,*" and stop the lifts and braces to the jackstays.

Get the lower booms fore and aft.

Pull up the boom topping lifts, and when high enough to swing into their places, man the after guys, ease away the fore guys. Take the stirrups off the booms, rigging them with the lower studding-sail tack blocks. Secure the boom with a lashing.

At sea, the boom is shackled to the goose deck in the fore chains, and the after part is generally allowed to rest on the outer arm of the sheet anchor.

Studding-sail gear ready.

Rig the topmast studding-sail booms out on the lower yards so that the inner ends will be clear of the lower stays when the yards are braced sharp up; secure the heel lashings, as booms without the rigging on have been occasionally rolled overboard off the yards in consequence of not being secured.

The top-gallant studding-sail gear is always ready.

Topmast studding-sail halliards are secured to the futtock rigging.

The topmast studding-sail tacks and the lower studding-sail gear is triced up under the top by the lower studding-sail tripping line; being stopped to the jackstay along the lower yard, up and down the lower rigging and along the ridge rope to the main rigging, a bight being left to allow the lower yard to brace sharp up.

TO GET UNDERWEIGH.

Shorten in cable.

The amount of cable to be hove in, and the quantity of sail to be set, must of course be regulated by the force of the wind.

Before making sail, heave in to a short stay (when the amount of cable out is a little more than the depth of water),

paul the capstan and stopper the cable; the nippers may be left on ready for heaving the anchor up. If the cable is not shortened in before making sail, it causes a heavier heave of the capstan.

Lying in an open roadstead and with a fair wind, the anchor may be hove up and the ship got underweigh under the jibs; sail being made when the anchor is secured, and the ship before the wind.

If lying amongst other ships, or in a close harbour, or with a foul wind, sail must be made before tripping the anchor.

Loose and make all plain sail.

The sail loosers, "*Away aloft,*" keep fast the lower booms; if triced up, the topsail sheets would probably get under the boom irons. "*Trice up,*" "*Lay out,*" let go the top-mast and top-gallant studding-sail halliards, and top-gallant studding-sail tacks.

Man the "*topsail sheets, top-gallant and royal halliards.*" Single the topsail clewlines, see that the men are clear in the fore part of the tops, and that the outside hands on the lower yards lay in as soon as possible clear of the topsail sheets.

"*Haul taut*" the topsail sheets. "*Let fall,*" "*Sheet home.*"

"*Haul taut the topsail halliards.*" Attend the braces, top-gallant and royal sheets. "*Hoist the topsails.*"

The top-gallant sails and royals should be hoisted at the same time as the topsails, the slack of the sheets having been taken in when the sails were let fall. Haul the gear of the courses taut up, stopper and overhaul the buntlines ready for making sail. Unhook the boom tricing lines.

The head sails are loosed, and left on the booms ready for hoisting.

The spanker is uncovered and the boom topped up.

Trim sails for casting.

If possible when the starboard anchor is down, prepare for casting to port, and *vice versâ*; otherwise the cable grows taut across the forefoot.

To cast to port.

Man the "*Port after-braces.*" "*Starboard head-braces.*" "*Overhaul the lifts and trusses.*" Attend the opposite braces and bowlines. Trice up the port after main-brace. "*Haul taut,*" "*Brace forward.*"

This brings the after yards braced up on the starboard tack, and the head yards on the port tack, to force the ship's head to port.

As the lower yards go forward, the gear of the courses, if taut up, and the boom tricing lines (if not unhooked) will have to be checked.

The main yard is not braced sharp up, as the tack comes down easier by leaving the yard-arm exactly over the tack block, and the sail is kept from jambing between the yard and the stays.

"*Up anchor.*"

The nippers being on, "*Heave round the capstan.*" When the cable is perpendicular, the word is passed from forward, "*Up and down,*" and immediately the anchor has broken out of the ground, "*Heave and aweigh.*" The man at the lead in the chains reports as the ship is moving astern. See the helm amidships. As she gathers sternway her head will be forced to port by the sails on the foremast. Hoist the jibs immediately that they will take the proper way, and haul aft the sheets (it is sometimes necessary to haul aft the weather head-sheets). Man the "*head braces and spanker outhaul.*" As the after sails lift, "*Brace round the head yards.*" Haul out the spanker. If the ship's head pays off too far, do not brace the head yards sharp up at once, and ease off the head sheets. As she comes to, brace up the head yards, and haul aft the head sheets. When the anchor is at the water's edge, the word is passed from forward, "Heaving in sight," and when up, "Avast heaving." "*Stand to the bars.*" "*Stopper the cable.*" "*Walk back the capstan.*" Off nippers, bitt the cable, hook the cat, "*Man the cat fall.*" "*Haul taut the cat.*" When the cat is taut, "*Keep hauling the cat.*" Off slip stopper, "*Serge the cable,*" and proceed as before described.

In a close harbour the ship must be got under steerage way as soon as possible; but if there is plenty of room, she

should not be allowed to gather headway until the anchor is at the cat-head. If anchored in deep water, it is sometimes necessary to heave-to.

If there is any difficulty in heaving the anchor out of the ground, use a deck tackle, lashing the double block to the cable, or a runner and tackle, the runner block being secured to the cable.

If the cable is very muddy and the turns of the nippers won't bite, pass racking turns with dry nippers and sand the cable.

The fire engine is used to clean the cable as it is coming in, the hose being passed out of a spare hawse-pipe, and used by a man standing on the bumpkin braces.

"*Make sail.*"

"*Overhaul the gear of the courses.*" The leechlines and slablines are well overhauled by men on the lower yards; the buntlines having been stopped and hauled up in the top ready to let run, Man the "*fore and main tacks,*" "*Haul taut.*" "*Ease down*" the clewgarnets, "*Haul on board*" the fore and main tacks, haul aft the sheets. "*Man the lee braces.*" Brace the yards sharp up, haul taut the weather braces, lifts, and trusses. "*Haul the bowlines.*"

See the sheets hauled well home, sails hoisted taut up, lower tacks close down, weather lifts up, and braces and bowlines well taut. Overhaul and trice up the lee after main-brace. Take down the slack of all the ropes not in use, and see all clear for shortening sail.

If the tacks of the courses are not hauled close down, the weather leeches of the upper sails will be slack, and the yards topped up when the weather lifts are pulled up.

TO MAKE A STERN BOARD.

If unable to stand out from the anchorage on either tack, and obliged to make a stern board.

Keep the ship perfectly upright. If she heels over either way the lee quarter will turn up towards the wind. There is no occasion to use the rudder.

Only use the topsails. Leave the yards square. Keep both head braces well manned, the helm secured amidships. As the ship gathers sternway steer with the head yards—

be very watchful and catch her directly, bracing the yards up a little on the port tack if the ship's head is inclined to go off to starboard, and *vice versâ*.

To go towards one quarter; suppose the starboard.

Brace all the yards up on the port tack. The head yards catching most wind will pay the ship's head off to port. Then by working the head braces, jib and spanker, the ship may be steered astern with the wind abeam. To keep the wind on the bow, brace in the after yards, just allowing the wind to take on the fore side of the sails. If they are braced up too sharp the lee quarter is so depressed in the water that it will be impossible to prevent the bow falling off, bringing the wind abeam, and perhaps on the quarter. With stern way the bow is inclined to fall off from the wind, for the same reason as when a ship has headway the stern is inclined to fall off; or, what is the same thing, the bow is inclined to come up towards or approach the wind. (See page 160.)

To cast with a spring and slip the cable—

Not having room astern to weigh the anchor in the usual way:

Furl the sails with the required number of reefs in, and prepare for making sail as quickly as possible. Hoist the topsail yards up the required height for setting the topsails. Cast off as many gaskets as can be spared, and if about to cast to port, brace the yards up on the starboard tack, and secure them well with rolling tackles and preventer braces. Haul aft the head sheets on the starboard side. Pass the end of a buoy rope in through the riding cable hawse hole, make it fast to the cable before the bitts, put a buoy on the outer end, and hang it ready to the bumpkin. Pass the end of the stream cable forward, outside all from the starboard quarter; make it fast as a spring to the riding cable at the hawse hole, haul it taut, and when well secured unshackle the cable abaft the bitts, close to the chain pipe. Shackle a slip stopper to the bridle, putting it on the third or fourth link of the riding part of the cable. Pay the slack chain below. Bowse to the compressor. Man the topsail sheets, fore and main tacks, and sheets; and when ready on deck, off stoppers and veer cable. The ship will sheer off to port. Hoist the head sails. Prepare the spring for slipping, but don't let it go. Veer cable until the slip is close abaft the bitts. Make sail as

quickly as possible, and allow the ship to spring ahead before slipping. She will try to come up into the wind in consequence of the great pressure on the lee bow, and having little headway. Slip the cable, and then the spring. Shift over the head sheets.

"Foul anchor."

When hove up to the bows: Put a foul-anchor strop upon whatever part of the anchor is above water, putting one bight through the other. Hook the cat block to the strop. Haul taut the cat, and proceed as before, until the anchor is up to the cat-head. Secure the anchor with the cat-head stopper, if possible, reeving it through the ring. Ease up the cat, let go, overhaul, and unhook it. Hook the cat to the ring, and the fish to the fluke, or both to strops on those parts. Haul taut cat and fish; ease down the cat-head stopper, hauling on the cat or fish, or both together, as necessary. When up, secure the anchor with the stopper, hang the cable, unshackle, clear, and shackle it again.

Unrig the fish davit.

Whilst unrigging, the davit is steadied to the foremost shroud, using the inner lower studding-sail halliards for a topping lift.

Unreeve the fish-fall, and use it for a whip to lift the gear off the davit head. The davit is then stowed with the inner halliards, either in the fore-chains or with the booms amidships.

TRIMMING SAILS.

The yards are sometimes all trimmed together; but in the following pages the plan of trimming the head yards separately has been followed, as being more in practice, and embracing both systems.

When the wind draws aft trim the after yards first.

When the wind draws forward trim the head yards first.

The crossjack yard is always trimmed with the main.

To brace in the main yard use the after brace; to brace forward, use the preventer brace.

Wind draws aft. One point before the beam.

"*Trim and make sail.*" Let go the bowlines. Check the sheets. Man the "*Weather after-braces.*" Attend the lee braces. "*Haul taut.*" "*Brace in,*" checking the main tack if necessary. When the lower yard is trimmed, "*Belay the main brace.*" The crossjack yard is trimmed with the main, the upper yards being braced in a little more than the lower yards, as the studding sails bring a great strain on the weather yard-arms, and drag them forward again.

Haul taut the main and cross jack trusses, and lee braces.

Man the "*Weather head-braces.*" Attend the lee braces. "*Haul taut*"—"*Brace in the fore yard,*" checking the fore tack if necessary. Trim the foreyard with the main. Haul taut the lee head-braces, fore trusses, and weather lifts. Take in the slack of the lee tacks and weather sheets, if the tacks have been started.

The "*Starboard fore topmast, and the top-gallant studding sails ready for setting.*" Topmen aloft, put "*burtons on the top-sail yards,*" and "*jiggers on the top-gallant lifts.*" Get the studding-sail booms ready for rigging out, the gear down, and the sails ready for setting, leaving only the proper setting stops on. The top-gallant studding sails are kept in the topmast rigging on their own sides, and are always ready with the gear bent. The topmast studding sail is stowed in the fore rigging with the outer arm up, but has no gear bent. Bend the halliards and tack. Get the tack and boom brace aft, securing the block to the three foremost shrouds of the weather main rigging, and leaving the ropes slack until the boom is out.

Man the fore topmast studding-sail boom jigger, and the studding-sail halliards and tacks, take a turn with the end of the deck sheets. "*Haul taut.*" "*Rig out.*" The top-gallant studding-sail booms are rigged out by hand, by the men on the topsail yard. "*Hoist away.*" (The heels of the booms are supposed to be secured by this time; but, to make more certain, two orders for hoisting the studding sails might be given, "*Trice to hand,*" swaying them up to the yards; then when the stops are cut, the heel of the boom secured, and the tack ready to be hauled upon, "*Hoist away.*" If the one order only is given, the

tack must not be touched until the boom is secured). The sails are swayed up to the men on the yards, who cut the stops, cutting them between the halliards and the yard, and light the sail out over the brace-block strop; then hoist the sails well up, having run the tacks out and secured them before the sails are hoisted too high. Haul taut the boom brace, and the top-gallant studding-sail sheets. The men on the fore yard reeve the short top-mast studding-sail sheet through the block secured to the boom iron, and it is then hauled taut and secured in the top.

Haul up the downhaul and deck sheet bent together, and pay them down before all ready for taking the studding sail in.

Studding-sail tacks and halliards will occasionally want hardening out and up, as the ropes not having been used for some time have probably shrunk.

To set or take in a studding sail when it is blowing hard, keep the ship away; this eases all the gear.

Wind draws aft. One point abaft the beam.

If the ship is heeling over, a lower studding-sail, equally with all the other square sails, is a depressing sail; but it is much more so if the lower studding-sail boom is abaft the line of the fore yard, which it usually is, particularly when the sail is set with the wind well forward, as there is then the danger of getting the boom under the bows.

The jib and flying jib are both lifting sails, and are therefore far preferable to the lower studding-sail if speed is desired. On the other hand, a lower studding-sail is a lifting sail if the boom and sheet is before the line of the fore yard.

If it is decided to set the lower studding sail—

"*Trim and make sail.*" Man the "*Weather after braces*" and trusses.

The starboard "*Lower studding sail ready for setting.*"

"*Haul taut,*" check the sheets as requisite; attend the lee braces. "*Brace in the main yard,*" checking the main tack, and, if necessary, raising it with the weather clewgarnet to lighten the work. The main top-gallant studding-sail

tack is kept out by the men in the top, as the topsail yard is braced in. When the main yard is trimmed, "*Belay the main brace.*" Truss the yard close to. Man the "*Weather head-braces*" and trusses, and the starboard fore-topmast studding-sail tack, and boom brace; check the fore tack; attend the lee braces. "*Brace in the fore yard.*" Keep the tacks close out as the booms come aft. Trim the fore yard with the main. Haul taut the lee braces, weather lifts, burton fall, top jiggers, and boom brace, and harden up the top-gallant and fore-topmast studding-sail halliards.

The lower studding-sail is usually kept on the booms on the opposite side of the deck, with the outer end forward; it is carried on to the forecastle, and the outer end placed on the hammock netting. The lizard is carried out on the lower yard, and secured round the yard-arm, or, if rove through blocks at the yard-arm and lower mast-head, hauled out by men on the deck.

Unlash the lower boom. Man the "*Boom topping lift*" and the "*fore guy.*" Let go the after guy and lower studding-sail tack, seeing them coiled down clear so as not to check the boom, and a turn taken at the square mark. "*Top away the lower boom.*" As it is topped up the boom goes forward of itself. Trim it as requisite, easing away the lizard (as the boom could not be hauled aft again with it out at the fore yard-arm). Bend the inner and outer halliards tack and tripping line to the sail. Cast off the stops, and secure the slip toggle round the sail close to where the halliards are bent. Trice up the inner halliards to get the sail off the deck. Man the outer halliards and tack. "*Haul taut.*" "*Hoist away,*" keeping one deck sheet fast inboard. The lanyard of the toggle is long enough to take the sail well clear of the forecastle; when taut, it pulls the toggle out and releases the sail. Pull the halliards close up, and when well stoppered take a turn with them. Haul out the tack, and harden up the inner halliards. Reeve the second sheet through a spare dead eye or block under the forechains, and secure it.

Haul taut the weather sheets, lee tacks, and take down the slack of the lee bowlines.

If the jib is not drawing, haul it down.

Man the "*Jib downhaul.*" "*Haul taut.*" "*Let go the halliards.*" Attend the sheet—"*Haul down.*" "*Stow the jib.*"

If the main-topmast studding sail is to be set, everything is done the same as when setting the fore-topmast studding sail, except that the boom has no brace. The tack is taken to the quarter.

Wind draws aft. On the quarter.

Trim sails.

Trim the after yards as before; manning the main topmast studding-sail tack, and keeping it out as the yards come in.

The head yards are trimmed as before; being careful to have the fore-topmast studding-sail tack and the boom brace well manned.

The lower boom is brought aft after the fore yard is trimmed.

If the flying jib is becalmed, haul it down and stow it.

Haul taut, and take in the slack of the same ropes as before.

Get the squaring marks of the lifts down, and rolling tackles on the yards if necessary.

If the wind is light, get a lazy guy on the spanker boom.

A mizen burton being hooked to the boom, and as far forward on the lee quarter as possible outside all.

Wind draws aft. One point on the quarter.

"*Trim and make sail.*"

Trim as before. Haul up the weather clew of the mainsail.

Port main-topmast and top-gallant studding-sails ready for setting.

The studding sails must be set before all, otherwise the eddying wind out of the square sails would get in on the fore side of them. The easiest way to set them is to stop the halliards to the inner yard-arms, and proceed as when about to set them abaft all in the usual way. The stop will break when the inner yard-arm is up to the jewel block, or a man on the upper yard may cut it; the sail will fall into its place before all. When studding sails are set before all, the inner yard chafes the head of the topsail.

It is the custom to keep a head sail set to assist the ship in

paying off, in the event of a sudden shift of wind, or the ship broaching to. But in fine weather, when neither event is likely to happen, the head sails are better stowed.

Wind aft.

"*Square Yards.*"—Man the "*Weather after-braces,*" trusses and studding-sail tacks. Attend the lee braces, "*Haul taut,*" "*Square the main yard.*" Pull up the lee clew and the gear of the mainsail. Brail up the spanker, hauling taut the boom sheets, vangs, and topping-lifts. Man the "*Weather head-braces,*" trusses, studding-sail tacks, and boom brace. Attend the lee head-braces, haul taut, "*Square the head yards.*" Raise the fore tack if requisite. Haul aft the starboard fore-sheet, and forward the port tack. Truss the yards close to. Get the square marks of the lifts down, and the port braces taut.

"*Port studding sails ready for setting forward.*"

Put the burton on the port topsail yard-arm, and the jigger on the top-gallant lift, and haul them well taut. Haul the port bowlines taut to steady the sails, whilst the men are at the yard arms. Set the port studding sails in the same manner as the starboard were set; remembering that the outer lower studding-sail halliards must not be hauled upon until the heel lashing of the fore topmast studding-sail boom is secured, and the boom brace taut, or the topmast studding-sail tack is out.

When running, a fore sail or any other square sail is made a lifting sail instead of a depressing one by easing the sheets well off. A raking mast has also the same effect.

Dip the port main top-gallant and topmast studding sails abaft all.

Lower the sail half-way down, keeping fast the tack; men on the yard-arm can gather down on the inner leach, and cant the sail abaft all, "hoist away." A slight alteration in the course, bringing the wind on the starboard quarter, will greatly assist them.

Or, without altering the helm, take the leading block of the topmast studding-sail downhaul aft to the fife rail. Lower the halliards. Haul down, easing the tack to allow the sail to get behind the topsail. The men on the yard can gather over on the sail, catch the outer yard-arm, and with it cant the inner yard-arm abaft the leach of the topsail.

If necessary dip the starboard studding sails before all.

Dip it as before by the outer yard-arm, canting the inner one before the leach of the topsail.

Or shift the short sheet before the topsail. Overhaul the bowline well. Lower the studding sail, hauling down on the downhaul until the inner yard-arm is clear of the leach, then ease away the downhaul and hoist.

Wind drawing forward on port quarter.

'*Shorten and trim sails.*" If possible with a sudden shift of wind alter course to bring the wind aft into its old position, until the lee studding sails are taken in. Man the starboard "*Lower studding-sail tripping line,*" "*Topmast and top-gallant studding-sail downhauls,*" long sheets, lower boom topping lift, and inner halliards. With the yards nearly square, the leading blocks for the topmast studding-sail downhaul and deck sheet are taken to the opposite side of the deck. Attend the starboard studding-sail halliards and tacks, and the short sheets. Men aloft on the lower yards get the booms ready for being rigged in, but they do not start anything before the studding-sails are down, on the topsail yard they also help the top-gallant studding sail round the leach of the top-gallant sail.

'*Haul taut.*" "*Trip up.*" The lower studding-sail tripping line and the boom topping lift are pulled up together until the lower boom is high enough to swing into its place; then take a turn with the topping lift, ease away the studding-sail tack, and run the sail up to the inner lower studding-sail yard-arm. Let go the short sheet of the topmast studding-sail. "*Lower away.*" "*Haul down.*" All the sails are lowered together. The topmast studding-sail yards are hauled out by the downhauls to within a yard of the boom end, then ease away the tack and the yards will cant over clear of the bowline or preventer brace. As the outer lower studding-sail halliards are lowered pull up the inner halliards, tripping line, and deck sheet, and when the sail is over the forecastle, lower away.

When the sails are clear of the booms they are rigged in. Ease away the fore guy, haul on the after guy, lower the topping lift, and place the lower boom.

Take the starboard burtons and jiggers of top-gallant lifts off. Clear the studding sails from the gangways.

"*Trim sails*," "*Lee head-braces*." Attend the weather braces, studding-sail tacks, and the boom brace very carefully, taking care that the studding-sail booms are always kept in a line with their own yards. Slack off the studding-sail sheets roundly, as they are easily hauled aft again. The lower studding-sail tack is also eased away well, the boom being trimmed afterwards. Overhaul the lee bowlines. "*Haul taut*." "*Brace forward the head yards*."

In bracing well forward have hands by the lifts, trusses, burton falls, lift jiggers, and studding-sail halliards, but don't slack too much. Just before the yard is trimmed, "*Hold on the weather fore-brace*," and when taut "*Belay the fore brace*." Haul forward the fore tack and aft the fore sheet as requisite. Trim the fore topsail and upper yards a little abaft the lower yard as mentioned before. Haul aft the short sheet as soon as the yards are trimmed.

Man the "*Lee preventer main-brace*." Attend the corresponding ropes as in bracing up the head yards; also the gear of the mainsail, which may be overhauled ready for dropping the lee clew.

Trim the after yards with the fore yard. Man the "*Main sheet*," "*Spanker outhaul*." "*Ease down*" the lee main-clewgarnet and the spanker brails. "*Haul aft*." Let go the lee boom topping-lift. Ease away the vangs and boom sheets as the spanker is being set.

Harden up the weather lifts and trusses and studding-sail halliards if requisite. Attend the after guy. Haul forward the fore guy and "*Trim the lower boom*." If the wind is far enough forward haul on board the main tack. "*Clear away the head sails*." Man the jib and flying-jib halliards. "*Haul taut*." Attend the down-hauls. "*Hoist away*."

The first pull on the halliards is much lighter than the last; therefore a few men should run away with the end, leaving the rest to double in when the sail is half up and it gets heavier. "*Steady aft the head sheets*."

Wind drawing forward; abeam.

"*Shorten and trim sails*." Man the "*Lower studding-sail tripping line*." The sail is taken in and the boom got aft as before

the ship having been kept away if requisite until the sail was in. "*Lee head braces.*" Brace up, hauling upon and attending the same ropes as before. After the head yards are up trim the after yards, and bring the ship to her course again.

The fore and main tacks and sheets and the head sheets will require hauling upon.

The trusses must be eased to allow the yards to brace up without nipping the lower rigging, but they must be hauled well taut afterwards. The lee lower-lifts must be let go as they nip round the lee topmast-rigging.

If the wind is likely to freshen, martingale the topmast studding-sail boom, make a knot or seize a toggle in the upper part of the lower halliards, haul it out to the boom end, and when well taut secure it on deck a little abaft the line of the boom; this will allow the topmast studding sail to be carried on without endangering the boom.

SHORTENING SAIL.

In royals, flying jib, and top-gallant studding sails.

"*In royals, and top-gallant studding sails.*"—Man the flying-jib downhaul, royal clewlines, weather royal-brace and the top-gallant studding-sail sheets and downhauls. Attend the flying-jib halliards and sheet, royal sheets, halliards, and lee brace, studding-sail tack and halliards.

"*Haul taut.*" "*Shorten sail.*" The men on the topsail yard help the studding sail in and then rig the boom in. Take the jigger off the top-gallant lift.

In taking in a flying jib if the halliards are let go and the sheet kept fast, the sail will run half-way down the stay itself, as the wind is out of the upper part; then by letting go the sheet the wind is taken out of the lower part and the downhaul hauls it down; keep both sheets eased off and let the men furl it by themselves, by passing the foot of the sail in first, then gathering up. If the weather sheet is hauled over, it is clear that the midship part of the sail must be full of wind, bringing an increased strain on the boom, and if blowing hard the men can do nothing with it until the sheet is let go, when, if left to themselves, they will find little trouble.

The men should not be allowed to pass the bowsprit cap until the sail is down.

In taking in a royal, if the lee sheet is let go and the weather brace hauled in, the weather sheet being kept fast, the wind is instantly got out of the sail; the pressure being taken off the parrel the yard will come down, being helped by the weather clewline, which is acting as a downhaul. When the yard is down, ease away the weather sheet and clew the sail up; trim the yard in a line with the wind and attend the helm, keeping the wind if anything a little on the after side of the yard—if it gets before it the sail is blown under the foot rope. Don't allow the men to go above the crosstrees until the yard is laid ready for them to furl the sail.

If both sheets were let go, the sail being then a lifting sail would be blown up to the mast-head rather than down.

In taking in a top-gallant studding sail; when the sheet and downhaul are well manned ease away the tack and halliards together.

If the jewel block is secured on the yard-arm close to the rigging instead of the bolt at the end, and the downhaul taken through a block fast to the horn of the after crosstree, the sail will come in easily in a squall. If there is room, keep the ship away, then none of the gear is endangered.

In main topmast studding sail.—When the yards are braced up, the leading blocks for the downhaul and sheet are secured amidships in the weather gangway as high as possible. Man the downhaul and sheet, attend the short sheet in the top and the halliards and tack, "*Haul taut,*" let go the short sheet, "*Lower away,*" "*Haul down.*"

The man attending the tack should ease away directly the yard-arm is close to the downhaul block. The yard is sure to cant clear of the bowline and brace if the man attending the halliards does not lower the sail too quickly. Light the sail over the ridge-rope, make it up as quickly as possible, and hoist it into its place up and down the rigging by a whip put on on purpose. The boom is rigged in immediately the sail is canted clear. Stop the gear up on the main yard, and up and down the rigging; take the burton off the topsail yard.

In fore topmast studding sail.—The same precautions are taken as

with the main. The sail when made up is got into the rigging by the inner halliards. Take the martingale off the lower halliards and stop the gear up.

Wind draws ahead.

"Trim sails." Man the "*Lee head-braces,*" fore tack and head sheets. "*Overhaul the lifts and trusses.*" "*Haul taut.*" "*Brace up the head-yards.*" The head sheets are hauled aft, and the fore tack close down, overhauling the weather lifts. The fore brace is always marked for bracing sharp up; when the mark is down to the main bitts, "*Belay the fore brace.*" The fore topsail and upper yards are trimmed with the fore yard, each yard being kept a little in.

Man the "*Lee main-brace,*" and main-tack. "*Brace up the main yard.*" There is no certain mark for the main yard being up. A common one is—when the fore topmast rigging, or weather corner of the fore top, can be seen clear of the leach of the main topsail from the weather side of the wheel. Belay the main brace. Trim the upper and mizen yards. Haul aft the fore and main sheets. Haul taut the weather braces, lifts, and trusses, and haul the bowlines.

After the tacks are down, the weather lifts are pulled up to tauten the weather leach of each sail, and when well taut, the bowlines are hauled forward to tauten and flatten the surface of the sail.

The marks for bracing up the lower yards are determined by noticing the strain brought on the stay and lee rigging, as it is evident that every pull on the brace after the yard is locked must be twisting the mast-head with half the length of the yard for a lever, and straining the weather yard-arm, bowing it forward. An angle of 20°, with the fore and aft line is the usual angle for a lower yard to brace up. The upper yards should be braced in a little more than the lower ones.

With a heavy head-sea, and the ship pitching, the yards should not be braced up as sharp as usual, in order to keep them clear of the stays; and, also, the sharper the yards are braced up the more depressing the sails become.

A topsail yard, when the sail is reefed, cannot be braced u sharp as when all the reefs are out, on account of th quarter taking against the lee rigging.

In first reefs of topsails.

"*Reef topsails.*" Take the "*Jiggers off the weather topsail-li* —"*Hands by the top-gallant sheets.*" See the look man off the fore-topsail yard. Let go the bowli "*Round in the weather topsail braces,*" to clear the yar the lee topmast rigging as the yard comes down. "*L the topsails.*"

The weather clewline is used as a downhaul tackle. When yard is down, but not before, haul out the reeftackles, haul taut the buntlines—the yard will brace in easie the ship is luffed to make the weather leach of the lift. Haul taut the topsail halliards, top-gallant sh and clewlines, and lee topsail braces—to steady the ya and sails—leaving the topsail yards braced well in take the wind out of the sails above the reeftack Pay attention to the steering of the ship, keeping upper part of the topsails lifting by luffing when necess "*Trice up.*" "*Lay out.*" "*Take in one reef.*"

Light out to windward—haul out the weather earings.

Light out to leeward—haul out the lee earings.

Secure the reef beckets, and lay in.

Let go the reeftackles and buntlines. Lower the booms.

"*Attend the weather topsail braces,*" easing the brace away as yard goes up, keeping the lee quarter from touching lee topmast-rigging. "*Hoist the topsails.*"

Many of the topsail yards that are sprung are first crippled hoisting the sails up too taut.

Settle the top-gallant halliards, haul out the top-gallant she and set the top-gallant sails. Trim the yards. H taut the weather braces. Pull up the weather jiggers. "*Haul the bowlines.*"

In first reef of spanker.

"*Reef spanker.*" Man the vangs and all the brails. *spanker*"—haul over the weather boom-sheet to stea

the boom. Settle the peak and throat halliards roundly, keeping the brails close up. Shift the outhaul to the first reef cringle, secure the earings, shift the tack tackle and tricing line; when ready, let go the brails; haul out the outhaul until the sail is steady; secure the tack; tie away the points; sway the gaff up, easing the vangs, and haul the outhaul out, easing the boom sheets.

If fitted with reef pendants, hook the reeftackle to the first reef pendant, and, when manned, settle the throat and peak halliards, hauling down on the weather vang, and both parts of the tack tricing line; haul the reef pendant close down, shift the tack, tie the points, and reset the sail.

Down royal yards.

"*Unbend the royal gear, and stop the yard ropes out.*" Unbend the royal sheets and clewlines, unreaving them, and securing the ends at the top-gallant mast-head. Take the purchase off the halliards, and stop it, now called the yard rope, out on the lee side. Let go all but the last turn of the parrel lashing. Haul taut the yard ropes. "*Sway away.*" Let go the parrel and weather lift, hauling in the weather brace to cant the weather yard-arm down abaft the top-gallant yard. Cast the stops off the lifts and braces. Unrig the yard, secure it to the after top-gallant backstay for a traveller, and lower away either into the top or down on deck. Unbend the yard ropes from the yard, rounding the ends up to the crosstrees, where they are secured, as it is impossible to say which tack the ship will be on when the yards are sent up again.

In mizen top-gallant sail, and second reef of topsails and spanker.

The topsails are reefed the same as before, but more care is requisite to steady the top-gallant sheets. It would be little trouble to roll them up and set them again afterwards.

The topsail yards cannot be braced sharp up on account of the lee rigging, and the top-gallant sails not having their sheets hauled close out, have more belly than before; therefore, the lower yards may be braced in a little,

easing the ship, and not straining the gear so much
there is probably now a heavy sea on the weather b
See the weather braces, trusses, and lifts well taut.

The mizen top-gallant sail is taken in the same as a royal.

The spanker is reefed as before, taking care that the sail d
not get over the lee crossjack yard-arm—the only p
ventive is to brace in the crossjack yard.

Set the fore-topmast staysail, down jib.

"*Clear away the fore-topmast staysail.*" Man the halliards. T
in the slack of the lee sheet. "*Let go the downha*
"*Hoist away,*" haul aft the sheet; don't take the turns
the sheet off the cleat without a stopper is passed.
the sheet is too taut whilst the sail is being hoisted, gr
strain is brought on the stay.

Don't let the men lay out on the boom until the jib is do
"*Man the jib downhaul,*" hands by the halliards and
sheet. "*Let go the halliards.*" "*Haul down.*" Wh
half-way down the stay, ease the sheet, and run the s
close down. If blowing hard, and the lee sheet is t
slack, it will probably get over the lee spritsail-gaff en
it can only be cleared by unreaving the sheet. Wh
most of the sail is furled, haul over on the weather she
to assist the men in overhauling the lee sheet.

A netting under the jib-boom keeps the sail from getting foul
the guys.

Get the small sails out of the rigging.

The fore-topmast studding sails are got down with the in
halliards.

The main, with a single whip in the rigging.

Lower the top-gallant studding sails out of the top, making
traveller of one of the weather backstays if necessary.

Send the royal yards on deck. Secure all the sails amidsh
on the booms, but if dry, unbend and sent them below

In fore top-gallant sail and spanker.

"*Shorten sail,*" "*Foretop men aloft furl the top-gallant sail,*" n
the fore top-gallant clewlines and weather brace, ha

by the sheets, halliards, bowline, and lee brace. "*Haul taut,*" let go the "*Lee sheet and halliards,*" "*In top-gallant sail.*" Haul upon both clewlines and the weather brace, keeping fast the weather sheet; when the yard is down, ease away the weather sheet and clew up. Haul up the buntline, lay the yard pointing to the wind, pay attention to the steerage of the ship, don't allow the men to go above the crosstrees until the yard is down; when the sail is furled, the yard is squared or left pointed to the wind.

Man the spanker brails, lee ones best; hand by the outhaul.

Brace in the crossjack yard, "*Let go the outhaul,*" "*Brail up.*"

Brace up the yard again.

To take a spanker or boom mainsail in when the clew is secured to the boom, man the tack tracing-line and both vangs, "*Let go the throat halliards,*" and when well down let go the peak halliards.

If the peak halliards are let go first, the gaff will never come down.

On preventer braces and parrels.

For the topsail yards, the block of a single whip is secured at the weather yard-arm, the hauling parts are taken as far aft as possible.

See a good strain on the weather lift-jigger, before hauling taut the preventer brace. A burton hooked abaft the rigging to the lee topsail yard-arm, is a good support, but don't forget to let it go before lowering the yard.

For the lower yards, the yard tackles are used, don't hook them too far aft, as the greatest strain likely to come on a lower yard is when the course is taken in and the topsail left to bow the yard-arms up.

Sailtackles cannot be used for preventer topsail-braces as they might be wanted for shifting the sail, &c.

Preventer parrels are fitted and secured to the yard the same as the regular parrels.

In third reefs of fore and mizen topsails.

Reef the topsails as before, hauling in the preventer as well as the weather topsail braces, man both clewlines for down-

hauls; if the burton is on the lee yard-arm, see it let when the yard is down secure it before the men allowed to lay out. Man the reeftackles, both buntli and weather clewline, and when they are well t check the weather topsail-sheet roundly, hauling buntline and clewline well up, and the weather reefta close out. The lee reeftackle will usually take the high enough for the lee earing to be secured with starting the lee sheet.

Whilst the sail is being reefed, as it cannot be braced u much as before, the lower yard may be braced in a li and well secured before the topsail is ready for hoist

Haul home the weather topsail sheet and "*hoist the tops* easing away both the preventer and the weather top brace, hook the weather lift-jigger, and haul it and burton on the lee-yard arm well taut.

After taking in a third reef it is customary in some ships to reeve the topmast studding-sail halliards from the je block, reeve them down before the sail, and secure th to the lower bowline cringle for a leechline, or re them through the cringle and secure the end to quarter of the yard.

If bands were fitted a few feet out on each quarter of a he topsail yard to allow one, or both the tye blocks to shifted out on one or both quarters, as the third reef v taken in, it would give a much greater support to yard, and little difficulty would be experienced in ho ing the topsail, if both halliards were used.

In main top-gallant sail.

The sail is taken in the same manner as the fore top-gall sail (page 187).

With top-gallant sails not properly fitted with buntlines, men are obliged occasionally to slide down the lifts, sail blowing round the yard so as to prevent them lay out in the usual manner. After the sail is furled yard is squared or left pointing to the wind.

Reef mainsail.

Man the clewgarnets, buntlines, leechlines, and reeftack "*Haul taut*," "*Up mainsail*," haul out the reeftack

slacking down the leechlines and clewgarnets if necessary, to allow them to be hauled close up. "*Trice up*," "*Lay out.*"

Too many inner turns of the earings cannot be passed. When the sail is reefed, steady aft the sheet, let go the gear, and ease down the lee clewgarnet, then ease down the weather clewgarnet, and haul the tack on board.

If short handed, or the men are at work about other things, the lee clewgarnet need not be hauled close up, but the weather one must, or the sail will shake.

NOTE.—After taking a reef in a course, the leechline and slabline blocks should be shifted farther out, so that in taking the sail in the leech should be brought up close to the yard.

Set fore and main trysails.

Get the trysail sheets aft the lee side, haul taut, attend the vangs and brails, "*Let go the brails*," and vangs, "*Haul aft.*"

Bend and set mizen trysail.

If the mizen trysail is bent to its own gaff, which is always kept lashed on top of the spanker boom, the spanker is lowered down and unbent, securing the gaff to the boom and shifting the halliards and vangs to the trysail gaff. Bend the head of the sail, lacing it to the gaff. Sway the gaff up, securing the luff of the sail to the hoops on the trysail mast, when the gaff is secured the sheet is taken aft, the lee side, and the sail set the same as the fore or main trysail.

Get rolling tackles on the lower and topsail yards.

Luffs are hooked to the rolling tackle strops on the weather side of each yard, and to selvagee strops on the mast, abreast the yard, and hauled well taut as the ship is rolling to leeward.

Down top-gallant yards and masts.

"*Unbend the top-gallant gear*," "*Stop the yard rope out*" on the lee side, the tripping line is bent round the weather foot rope

with a bowline knot, and is sent down through the lubber's hole, which has the trap hatch open, on the weather side. "*Haul taut the yard rope*," "*Attend the braces*," "*Sway away*." Let go the parrel and weather lifts, steady both braces taut, to prevent the yard knocking about. "*Lower away*," don't unrig the yard until the lower yard-arm is at the lower cap and the upper one at the crosstree. Lower away, sending the yard down through the lubber's hole on the weather side, if necessary a traveller may be made of the weather topsail-lift; unreeve the top-gallant yard rope, keeping the end fast to the cross-trees.

If the top-gallant yards are pointed to the wind, they must either be squared before swaying, or the weather brace must be hauled in as the yards cant.

Unreeve the royal yard rope keeping the end aloft at the cross-trees.

Send the end of the top-gallant mast-rope down out of the top.

Clear away the top-gallant and royal backstays and stays, don't let them go, have plenty of careful hands attending them and the top-gallant rigging falls, especially the weather ones.

"*Haul taut the mast ropes*," "*Sway away*" out fid. "*Lower away*" roundly, taking in the slack of the rigging falls and stays. Send a rope's end up from the weather side of the top, for a heel rope, the bight and other end being sent on deck through the weather lubber's hole, with the trap hatch thrown back; when bent to the heel of the mast, "*Lower away*," pass the lizard.

To get the heel of the mast past the topsail yard, the yard must be lowered, in some ships even on to the cap; man both topsail clewlines and buntlines, and weather braces, round in the braces, and when the yard is clear of the lee top-mast rigging, lower the topsail by hand. If the top-gallant mast jams at all, and the yard is likely to be left down, any time, the weather reeftackle must be hauled out; as soon as the mast is clear, hoist the top-sail again.

To prevent the sail shaking, the ship might be kept away a point, then there would be no occasion to man any ropes beyond the braces to steady the yard. The top-gallant masts are lowered on deck, if the mast-ropes are unrove they are

more out of the way, and the masts can be placed on the booms and secured; secure the rigging at the mast-head, and haul it taut down into the chains. If the top-gallant masts are only housed, the yard ropes need not be unrove, the heel must be well secured round the topmast, and the rigging and stays shortened with catspaws, and set up. The heel of the mast will chafe the topsail tyes and other ropes, so it is preferable to send the masts on deck. After the top-gallant masts are struck, it will ease the jib-boom if the jib-stay is slacked, but this must not be done when the masts are fidded, as it would bring an increased strain on the top-gallant and royal stays.

In flying jib-boom.

Unbend the flying jib, sending it in on the weather side. Secure an inhaul to the heel of the boom, check and attend the flying jib guys and martingale, let go the heel and belly lashings, haul out on the heel rope; when the heel is clear "ease in," hauling in on the inhaul. Unrig the boom, securing the rigging to the jib-boom end; stop the outer end of the boom to the heel rope with a lizard and ease it in.

In third reef of main and fourth reef of fore and mizen topsails.

The third reef of the main topsail is taken in, in the same manner as the fore topsail (page 188).

In taking in the fourth reef of the fore and mizen, both clews will have to be hauled up to get the reeftackles out.

Steady the yards with the rolling tackles whilst reefing.

The topmast studding-sail halliards, if rove as leechlines, will be a great help in steadying the sail.

In hauling home the sheets, haul home the lee one first, then the weather one, easing the weather braces as the sheet is hauled home. Hoist the topsail yards up clear of the cap and haul taut the rolling tackles.

In first reef of foresail—Furl mizen topsail,

The foresail is reefed in the same manner as the mainsail (page 189).

To take in the mizen topsail, lower the yard on to the cap, haul up the weather clewline and both buntlines, hauling them well taut before the sheet is started: man the clewline and brace, start the lee sheet, hauling up the lee clewline; when the sail is secured with the clewlines, buntlines, and reeftackles, brace the yard in pointing it to the wind for furling. When it is secured send the men aloft to furl.

The sail will not blow through the buntlines if the sail is well full, or if the ship is kept away a point.

Reef trysails.

Reef all together, or one at a time, according to circumstances.

Brail the sail up, hauling on the lee brails best, steady the gaff with the vangs, cast off the tack lashing, hook two burtons for peak and throat halliards, sway up the gaff, hang and unhook the pendants which support it and lower away, hauling on the vangs and brails to steady the sail; reef the sail, shifting the block of the sheet from the clew up to the second reef cringle, when reefed, sway away on the burtons, hook the pendants, secure the tack lashing, haul taut the sheets, "*Let go the brails*," "*Haul aft.*"

If the ship is kept away a point, a trysail may be brailed up, or set without a shake, as it always flies into the lee rigging; have plenty of hands on the sheet or lee brails, as the case may be.

Bend storm trysails and fore-staysail.

The fore and main trysails are brailed up and lowered as in reefing, unbent, and the storm-sails bent and set.

The fore-staysail is worked on a stay of its own, the stay is fitted with a fork, and secured round the mast-head with the other stays, it reeves through a clump block on the bowsprit, inside the heel of the jib-boom, and the end, with a heart turned in, is set up to a heart shackled to a bolt above the bowsprit, between the knight-heads.

The clump-block is iron bound and shackled to a hoop on the bowsprit, or fitted with a single strop with two lashing eyes lashed together under the bowsprit.

The tack is secured to the stay, or round the bowsprit, the halliards, which are double, are rove through a block secured with a long lashing round the lower mast-head, so that the halliards may work clear of the fore yard, through a block lashed to the head of the sail, and the end secured to the slings of the fore yard or the upper jear-block strop, the sail is secured to the staysail stay with beckets, fitted with an eye at one end and a Matthew Walker knot at the other, toggled round the stay; the downhaul is double rove through a block secured to the stay, through a block lashed to the head of the sail, and the standing part secured to the stay; the sheet is a good luff, the double block being hooked to the clew and well moused.

When the sail is bent, stow it on the bowsprit.

Hook and man the relieving tackles.

The relieving tackles are fitted as luff tackles, the double blocks are hooked to strops or bolts at the end of each arm of the yoke, and the single blocks to bolts in the ship's side.

The tackles are kept taut, and worked in concert with the wheel.

If another set of wheel ropes can be rove and worked by a separate wheel, it will be far preferable to relieving tackles, which of course can be used as well.

Furl mainsail.

Man the weather clewgarnet, leechlines, and both buntlines, the two latter having most hands, for the same reason as the lee brails in a spanker are manned best.

Hands by the main tack, sheet, and bowline, "*Haul taut*," "*Ease away the main sheet*" to take a little of the wind out of the sail, but not sufficient to shake it, "*Ease away the main tack*," let go the bowline, "*Haul up*," man the lee clewgarnet, and gear, haul taut, ease away the sheet and run the sail up as quickly as possible. The sail will come in without a shake.

Directly the main tack is started, the main yard loses one of its chief downward supports, the tack acting against the upward drag of the main topsail, therefore, before taking

the sail in, get another pull of the rolling tackle, preventer main brace, which should not be led to aft.

If there is any difficulty in furling the mainsail, clew up main topsail, brace in the main yard, pointing it to wind, haul taut the rolling tackle, and when the yar secured, send the men aloft to furl the sail, passing a gasket round the yard and the sail from the yard-a in towards the bunt.

Furl fore topsail and mizen trysail, and close reef the main tops

The fore topsail is taken in as the mizen topsail was (page 1

The studding-sail halliards, rove as leechlines, will enable sail to be hauled up very snugly on the yard before men go aloft. After the sail is furled, brace the yar clear of the lee rigging, and secure it well.

With the foresail set without the fore topsail above it, the p venter brace should be as far aft as possible, not to br a downward strain.

Brail up the mizen-trysail, manning the lee brails best; the is secured with a good gasket round the sail and the and trysail-mast.

The main topsail is close reefed, the same as the fore top was (page 191).

Whilst the sail is being reefed, secure the main yard afresh.

Furl foresail.

The foresail is hauled up and furled as the mainsail was (p 193). The preventer brace is of no use when the sa not set, therefore unhook and trice it up into its pl Leave the fore yard pointed to the wind, and secured with the trusses, rolling tackles, braces, an possible, both lifts; but the lee lift must not be allo to cut the lee topmast rigging.

Set fore staysail.

Hook the single block of the luff used as a sheet, aft on the side, haul it taut, and belay ready to ease if requi

Man the halliards, haul taut, let go the downhaul, and run the sail up quickly. It will probably shake at first, so the sooner it is up the better. Ease away the sheet as the sail is hoisted.

In fore topmast staysail.

Haul the sail down the same as in taking in a jib (page 186).

Lying to.

Sail should be set to allow the ship to remain as steady as possible; with too much head or after sail she will be continually yawing about.

Sail should be made to steady the ship, but not to force her against a head sea, as the wind goes down quicker than the sea.

SET FORESAIL OR MAINSAIL.

Leave the yard secured until the sail is set. Ease down the yard tackle, and hook it as far aft as possible for a preventer brace. Loose the sail and let fall when ready, the gear being kept fast. See the gear all clear, and overhaul the lee tack well. Man the lee sheet, haul taut, let go the leechlines and slablines, then ease down the buntlines and lee clewgarnet, and haul the sheet far enough aft to prevent the sail shaking, but not far enough for the sail to hold much wind. Man the tack and weather bowline, let go the weather gear, ease down the weather clewgarnet, haul on board the tack, haul aft the sheet; then trim the yard, bracing it forward as requisite, having careful hands attending the weather braces, rolling tackles, and trusses.

With a heavy sea and light wind it is better to set the topsails before the foresail.

Down fore staysail. Set fore topmast staysail.

The fore staysail may be hauled down before or after the foresail is set.

Set the fore-topmast staysail as before.

Man the fore staysail downhaul. Hand by the halliards. Ha taut.

Let go the halliards, haul down. When the sail is down, l go the sheet.

Set the close-reefed fore and mizen topsails.

Leave the yards secured until the sails are set. Let fall th sails when ready. Man the lee sheets, hands by th buntlines and lee clewlines, and the foretopmast stud ding-sail halliards fitted as leechlines. Haul taut. Kee the ship away to fill the sails. Ease down, "*haul hom the lee sheets.*" Man the weather sheets. Ease down th weather clewline—*haul home the weather sheets*, spillin the sail with the helm if requisite. When the sheet are home, hoist the sails clear of the cap, and brace th topsail yards up, attending the same ropes as before i reefing topsails, page 184.

Shaking reefs out of topsails.

Haul taut the reeftackles and buntlines. Man the weathe brace. Lower the halliards roundly—the yard is brace in to clear the lee rigging as it is being lowered, and als to take some of the wind out of the sail. The reeftackle being hauled up before the halliards are lowered, tauter still more as the yard comes down. The yard is no required to be lowered on to the cap, as, the reeftackle being taut, the yard cannot cant even with more men o one side than the other. Cast off the midship point first, and don't ease down the earings until all the point are off. After the reef is out, the turns of the halliard must not be taken off the cleat whilst one man remains on the yard.

A HEAVY SQUALL TO WINDWARD.

In spanker and upper sails, up mainsail. Lower the topsails bracing the yards in clear of the lee rigging, but no squaring them, or the reeftackles cannot be hauled out

If there is time brace in the lower yards. Haul the reeftackles close out. Buntlines, clewlines, lee braces, and trusses well taut. Set the fore-topmast staysail. Down jib and stow it if possible. When the squall strikes the ship, if necessary keep away.

It is recommended to keep the foresail set to assist in paying the ship's head off.

The sail can usually be shortened and the men below out of the rain before the squall strikes the ship.

In squally weather, if it is wished to carry sail until the last minute, have hands by the top-gallant halliards, lee sheet, and weather brace.

A sudden shift of wind.

If the ship has way enough, use the helm to bring the wind into its old position, shortening sail at the same time; then trim as requisite and bring the ship to her course.

If the ship has not sufficient steerage way, up mainsail and spanker. Square the main yard, shortening sail as requisite at the same time. Then manœuvre with the head and mizen yards.

If the wind shifts on to the lee bow, "go about" swinging the after yards as soon as possible, and shortening sail if necessary.

Heavy dew or wet weather.

The sails and all the ropes shrink and shorten in cold or wet weather, and give out again in dry or warm weather.

Therefore the halliards should be lowered, and the tacks and sheets checked a little.

The longer the rope the more it takes up, therefore royal halliards and top-gallant sheets and halliards are the most likely ropes to carry away.

Jib downhaul carried away.

The sail would probably be half-way down the stay, having been hauled down for a squall. Check the jib sheet to take the strain off the jib stay. Set the jib again, haul-

ing the sheet aft sufficiently to steady the sail, but bring too much strain on the boom or stay.

Unbend the lee fore top-gallant bowline, secure it round the stay with a bowline knot, and let it slide down to the h of the jib. Haul the sail down.

Jib halliards carried away.

Haul the jib down with the downhaul, easing the sheet wl the sail is about two-thirds down the stay. Bend stay-sail halliards in the place of the jib halliards. H away.

Jib stay carried away.

If the jib does not split at once, check the sheet to spill the s but not sufficiently to shake it; put the helm up at same time. Keep the ship away to becalm the sail; th haul down and stow the jib. Hoist the fore topm staysail, bringing the ship to her course.

Tack of jib carried away.

The tack will fly up the stay a little, bringing more strain on let go the halliards and haul the sail down as quickly possible.

Weather top-gallant brace carried away.

The top-gallant yard will fly fore and aft against the stay, bri ing a great strain on the parrel.

Let go the halliards, the lee top-gallant sheet, and brace, and weather top-gallant bowline, keep fast the weather she this will take the wind out of the sail and relieve the t gallant mast. Clew down on the weather clewline. Wl the yard is down, haul up the lee clewline and the bu lines, the weather clew will be aback and the yard can secured to the weather rigging, the weather clewline bei hauled up when convenient.

If the yard is not steady, which would be the case if the wi was on the quarter, when the sail is clewed up and t

buntlines hauled up; haul taut the lee brace to bind the yard against the lee rigging, secure the bight of the lee bowline round the quarter of the yard, and use it as a brace to brace the lee yard arm forward; secure the weather yard arm to the weather rigging and reeve the new brace, furling the sail first if necessary.

If the top-gallant studding-sail is set, let go the studding-sail halliards, taking the sail in as before (page 115), the top-gallant sail can then be managed as above, taking the jigger off the weather lift.

Weather main top-gallant brace and parrel carried away.

The top-gallant yard will fly fore and aft, bringing a great strain on the weather sheet, the stay, and lee rigging, screwing the masthead round.

Let go the lee top-gallant sheet to shake the sail, up mainsail, square the main yard, this will bring the sail aback; haul home the lee sheet as the sail takes aback, let go the top-gallant halliards hauling down on both clewlines, secure the bunt of the yard to the mast, then clew up and brace up the main yard, steady the weather top-gallant yard arm as before.

Weather topsail brace carried away.

Slack the lee sheet to spill the sail, but not enough to shake it too much, *in top-gallant sail, up mainsail*, man the weather main brace, attend the opposite braces, *square the main yard.* When the sail is taking aback, lower the topsail clewing the yard down with the weather clewline, secure the weather quarter of the yard to the rigging, steady the lee brace taut, put on the single whip for a preventer brace, make sail, and then reeve the new brace.

Topsail parrel and weather brace carried away.

Bear up to becalm the sail as much as possible, slack the lee sheet to spill, but not to shake the sail; in top-gallant sail, up mainsail, trice the sail tackle up to the masthead, abaft all; hook the two pendants together round the tyes on the weather side of the mast, letting the sail tackle slide down to the yard; hook the lower block

well aft on the weather side of the deck, lower the halliards, hauling on the sail tackle and both clewlines. When the yard is on the cap, clew the sail up, secure the yard as before, and bring the ship to the wind.

Parrel of topsail yard carried away.

Use the sail tackle as before, or ease off the lee sheet to spill the sail. Bear up, ease off both sheets, hoisting the yard to the mast-head; the sheets being eased off, will leave little wind in the sail, which will be steady; there will not be much strain on the mast-head; secure the yard to the mast, lower it to the cap, clewing up the sail, and bring the ship to her course again.

Or, if the ship cannot be kept away, slack the lee sheet, square the main-yard, heaving the topsail aback, haul home the lee sheet, lower the topsail, when the sail is aback, hauling down on both clewlines.

Weather main brace carried away.

Slack the lee sheet of the topsail and course to spill, but not to shake the sails, up mainsail, lower the topsail, steady the yard with the preventer braces, reeve a new after main brace, and make sail.

Weather fore brace carried away.

Proceed as above, when the sail is shortened, leave the yard braced sharp up to steady it.

If not blowing hard, check the sheets, but don't shorten sail, ease down the yard tackle, hooking the lower block as far aft as possible; haul taut this preventer brace, haul home the topsail, and aft the lower sheets.

Weather preventer main brace carried away.

This usually happens in tacking, from the fore and main yards fouling each other.

Brace the yard partly up with the lee after main brace, hauling forward on the main-top bowline and main tack, and aft on the lee main topsail brace at the same time; as the

main tack is being hauled down the lee after main brace must be slacked, or the yard will be sprung, reeve the new preventer brace as quickly as possible.

Weather cross-jack brace carried away.

This usually happens in tacking, in consequence of the cross-jack yard-arm catching the main royal backstays.

If the yard is left square, the ship falls further to leeward than if she is kept away a little to fill and steady the sail, the topsail brace and bowline being used to brace the sail and yards forward.

Or square the yard with the other brace, cast off the weather mizen topbowline, bend it round the yard-arm, brace forward and then reeve a new brace.

Weather topgallant sheet carried away.

The sail and yard will fly up and forward against the stay, remaining perfectly steady, haul taut the weather bowline, ease away the lee sheet to spill the sail, let go the halliards, hauling in the weather brace; as the yard comes in, haul up both clewlines, easing the weather bowline.

Weather top-gallant sheet and clewline carried away.

This can only happen when the clewline and sheet are fitted together.

Proceed as before, when the sail is aback and the yard down, haul the weather clew up abaft the sail on to the cross-trees, bend the clewline, reeve the new sheet, and make sail.

Weather topsail sheet carried away.

Same as weather top-gallant sheet (page 201), using the reef-tackles and buntlines to steady the sail when it is aback.

Weather topsail sheet and clewline carried away.

Same as weather top-gallant sheet and clewline (page 201), haul the clew into the top, abaft the other part of the sail, hanging it to the rigging.

If the topmast studding-sail halliards are rove for a leechline, they are now invaluable.

Lee topsail sheet and clewline carried away.

Haul in the weather brace, let go the halliards, haul the yard down with the weather clewline, and get the sail aback. When it is on the cap, start the weather sheet, haul up the weather clewline, and both buntlines and reeftackles, when aback haul the lee clew into the top abaft the sail, bend the new clewline, then the sheet.

Weather topsail reeftackle carried away.

This usually happens when reefing topsails, if the yards are not properly laid; call the men off the yard, clew up the weather side of the sail, up buntlines, brace in the yard until the sail is aback, haul the leech into the top, reeve the reeftackle afresh, haul it out, brace the yard up for reefing, lay out and take the reef in, haul home the weather sheet.

Fore or main tack carried away.

Steady the bowline taut, ease the sheet to spill the sail, haul up the weather clewgarnet and gear, then the lee clew-garnet, reeve a new tack, and make sail.

If not likely to go about, take the weather sheet for a tack, and reeve a new weather sheet.

Fore or main sheet carried away.

Bear up to save the sail. If the clewgarnet is touched it is sure to carry away and make matters worse. Steady taut the lee tack. When the wind is abaft the beam, haul up the clewgarnets, and bring the ship to her course again.

If not likely to go about, take the lee tack for a sheet, and reeve a new lee tack.

Weather shackle in the clew of a course carried away.

Bear up, lower the topsail, when the wind is well abaft the beam, up lee clewgarnet and gear. Square the lower yard, bring the ship to the wind with the weather clew of the sail aback in the rigging, secure it there, replace the shackle, and make sail.

If not blowing hard, the lee clew can be taken in without keeping the ship away, and the topsail need not be lowered, as the topmast stays will stand the strain of it being aback.

Lee shackle in the clew of a course carried away.

Bear up to save the sail, lower the topsail, up weather clewgarnet and gear, when the wind is well abaft the beam haul up the lee gear and square the lower yard, bring the ship to the wind with the lee clew of the course aback in the lee rigging.

Short sheet of a topmast studding sail carried away.

The deck sheet ought to be fast on deck. If not, haul it taut and secure it. Send a rope's end out of the top, down on deck outside the inner boom iron, between the studding sail boom and the yard; make a bowline knot round the long sheet, haul up in the top. If the short sheet cannot be reached, this may be left until the sail is taken in.

The weather wheel rope carried away.

If beating to windward—Go about, the strain will then be all on the opposite wheel rope, hook the relieving tackles, and the broken one can be repaired.

If the wind is abeam—The ship is sure to fly up into the wind. Up mainsail and spanker, heave to, taking care that the ship does not come round on the other tack.

Lee wheel rope carried away.

This can only happen when running, as there is no strain on the lee wheel rope at any other time. Let the ship come up to the wind until it is abeam, then steer with the weather wheel rope and the relieving tackles until the other one is repaired.

If both wheel ropes are gone, or if the ship cannot be hove to, or put about, hook the relieving tackles, but in the meantime she may be steered without the rudder with the wind abeam, if all the upper sails, mainsail, spanker, and mizen topsail are taken in, the head yards braced in or up as necessary, and all the men sent on the weather side of the ship to relieve the pressure against the lee bow as much as possible.

Jib-boom carried away.

Heave to, or the wreck will be difficult to get on board.

Strike the fore top-gallant mast, as it has no support for the stays; hoist the fore topmast staysail for a head sail and to becalm the jib, the foresail being left set for the same purpose. Trice up the sail tackle before all to the topmast head. If the head of the boom is above water, cut the tack and the lashing of the jib downhaul block, let go the jib halliards, hauling the sail down let go the end of the jib stay and unreeve it from the sail, get the wreck out of the water, using the lee fore bowline and buntlines, both inner halliards, and the sail tackle.

Or, as soon as the jib is in—"Go-about"—and use the foreyard tackle to lift the wreck inboard with, when the wreck is sufficiently out of the water make sail, out new boom, and up fore top-gallant mast.

Fore stay carried away.

Bear up and shorten sail to take the strain of the main topmast off the foremast; secure the mast with runners and tackles, and the fore and main topmasts with sail tackles.

Pass a hawser up before all, through the lubbers-hole round the masthead and down the other side, knot the two parts

together with a carrick bend round a heart which is seized into the bight clear of the knot. Reeve a lanyard and set the hawser up to the collar on the bowsprit as usual.

A good drift should be left between the two hearts as the hawser is likely to give out, and will require setting up again.

When setting up render the bight round the mast head to allow the two parts to bear an equal strain.

Down runners and tackles and sail tackles.

If fine weather the runners and tackles need not be put on the mast.

Bobstay carried away.

Bear up to take the strain of the foremast and main topmast off the bowsprit, shorten sail, secure the foremast with the runners and tackles, and the fore and main topmasts with the sail tackles. Let go the jib stay and strike the fore-top-gallant mast to take all the upward strain off the bowsprit and jib-boom.

Pass a chain strop round under the body of the ship and up the other side, with a chain secured to it as close to the keel as possible for a temporary bobstay.

To fit this chain, pass two ends of the stream cable, one on each side of the ship, out of two opposite ports well aft and above water, carry both ends forward outside of, and under everything, and shackle them together in the head to form a strop; to this strop secure one or two lengths of stream cable for the bobstay, either by shackling each separately to the strop, or by shackling the two together round the strop, the two upper ends are shackled together round a heart, which is secured in, and a lanyard rove as usual.

Ease the chain down under the bottom of the ship, hauling up on the two after ends through the ports, until there is only sufficient left for setting up.

Secure the bowsprit and bring the ship to her course again.

The temporary bobstay should be as short as possible, the only requisite being that the strop is a little abaft the fore-foot.

The farther the strop is taken aft the more strain it will bear. In small ships a shorter distance than 90 feet will answer.

To fish a lower yard.

The two pieces of the yard being across the gunwale, or on deck in the waist, bowse the two broken parts together with an up and down tackle and luffs as requisite; when properly placed nail the iron fishes on the fore and after sides to keep the pieces close together, take the anchor stock off one of the sheet anchors, hollow the yard out about three inches on the top and bottom to fit the two anchor stock pieces, secure them in their places with temporary lashings and wedge them well in; bolt through both parts of the anchor stock and the yard, with eight or ten bolts clinching the ends; fill up at the sides with capstan bars, then woold all together with well-stretched rope, wedging the lashings and securing them together, to prevent working off. Fig. 307.

The main yard of HMS. *Hero*, in 1861, which had carried away entirely, was fished with the following spars in about ten hours and stood perfectly in heavy weather afterwards:

One fore topmast studding-sail boom,
One fore top-gallant studding sail boom,
One main top-gallant studding-sail boom,
Fourteen capstan bars,
Three fishes, and
One elm plank 2½ inches thick, by 11 inches wide, and 24 feet long.

These spars, with 300 fathoms of 3½ and 4½-inch rope, used for wooldings, weighed 1 ton 18 cwt., being 14 cwt. more than the two main topmast studding-sail booms, which were not replaced aloft. Fig. 308.

All fished yards are heaviest on the damaged side, therefore the yard arm requires an extra support.

To make a temporary lower yard.

The two topmast studding-sail booms are equal in length to the lower yard.

With these for the length, the yard is made up by the most convenient spare spars, woolding altogether with a number of well-stretched lashings.

MAN OVERBOARD.

On all occasions "*Put the helm down*," "*Hands shorten sail*," "*About ship*," "*Life boat's crew away*," lower the old weather quarter boat as quickly as possible, before the ship has lost her headway; but as she has altered course, order the officer not to pull astern, as he is very likely to do, and to look out for signals.

Let go the life buoy as close to the man as possible.

Send some one aloft in the mizen rigging to keep his eye on the man.

Bend the starboard (M) and port (N) signals on, hoist them to the main and mizen mast heads at the dip, and when one is wanted for directing the boat, hoist it up to the truck.

If on a wind.

Up courses, in upper sails, proceed as in tacking, leaving the main yard square. The ship being hove-to will drop on to the man, particularly if the cross-jack yard is braced aback or up as requisite to force the ship ahead or astern.

Studding-sails set.

In royals, let go the studding-sail tacks, and take the sails in at once; brace up the after yards, warning the men to hold themselves fast before touching any of the braces; take the lift jiggers off and let go the burton falls.

"*Stations for about ship.*"—As the sails lift up mainsail, when head to wind, square the main yard, brace round the crossjack yard. When her head is paying off on the other tack, brace round the head yards, hauling the fore tack on board and the fore and head sheets aft. As the ship will require to forge ahead, if the wind was nearly aft and she has taken a large sweep in coming round, the main yard may be braced up as requisite.

When running, the wind does not strike the sails with so much force as when the ship is close hauled, as then she is approaching the wind, therefore in rounding to, besides

taking in the studding-sails, the upper sails must be taken in.

Again, the masts are not so well secured from forward, as they are from aft, therefore before heaving to, sail must be shortened, otherwise the stays will have too much strain brought on them.

The topsails, being the principal working sails, should not be lowered; if obliged to reef, do so as quickly as possible.

The great object when a man is overboard is to approach the man, and also the boat in the event of accident to her, a thing of not unfrequent occurrence. The ship, if hove to, is constantly drifting away from them, and her way will not be stopped so soon as by tacking.

When running, if the foresail were hauled up and the main-yard braced up, the ship would come round quicker, but as sail always has to be shortened, by the time those ropes were manned it would generally be too late for the evolution.

The weather boat is recommended to be lowered in preference to the lee one, because she is much easier kept clear of the quarter, when the stern is moving round sideways to leeward against the water, and if the helm is put down at once the ship will be upright, or nearly so, by the time the boat is ready for lowering.

If the lee boat is lowered, she is always swept against the counter, is the furthest boat from the man, and has great difficulty in getting away from the ship until after she is round.

Again, the weather boat becoming the lee one enables her to be hoisted up immediately on her return.

The quarter boat's davits are usually fitted with jackstays and foot pieces, to enable the men to get into the boats quickly.

Fit a man rope for every two men, and a jacob's ladder from the mizen chains.

A tub containing blue lights and a match, should always be kept in each quarter boat.

If she is lowered at night the lighted match from the aft deck should be taken.

A light unless covered blinds the coxswain.

LIFE BUOYS.

The common service life buoy always capsizes when a drowning man clings to it, owing to his trying to get as high out of the water as possible.

It is intended for him to place his feet on the bottom step, but as that keeps his head only above water, few men have the presence of mind to trim it properly.

If the buoy is let go at night, the match must be lighted before the buoy is let go. The right handle is to light the match and the left-hand one to let go the buoy.

If the right handle is painted red and the left-hand one white, they can be easily distinguished apart in the darkest night.

Kisbie's circular life buoys are usually distributed about the upper deck, and in the new long ships, the buoy thrown from the gangway often falls closer to the man, if he has fallen overboard from forward, than the one thrown from aft.

A kisbie has lately been fitted with a light, for night use, by Mr. Dennis, R.N. It is very useful, but being rather unsightly against the stern of the ship has gained enemies.

STRAIN WHICH A CHAIN OR ROPE WILL BEAR

Showing the Steady and Working Strain to which a Cable, Ch or Rope, may be put.

Steady strain.	Working strain.	Chain.		Rope.		
		Cable.	Rigging.	Wire.	Hawser laid.	Cable laid.
In tons.		Diameter of link.		Circumference in inches.		
91	22·5	2¼	..	..	..	..
81	20	2⅛	..	..	..	26
78	19·5	..	..	..	..	25½
75	18·5	..	..	..	..	25
72	18	2	..	..	..	24½
69	17	..	..	..	..	24
66	16·5	..	..	..	..	23½
63·5	15·5	1⅞	..	..	..	23
60·5	15	..	..	.	..	22½
58	14·5	..	..	..	..	22
55	13·5	1¾	..	..	..	21½
53	13	..	..	..	..	21
50·5	12·5	..	..	..	..	20½
47·5	12	1⅝	..	..	..	20
45·5	11·4	..	..	..	..	19½
43·5	11	..	..	8	..	19
40·5	10	1½	..	7½	..	18½
38·5	9·5	..	..	..	..	18
36	9	..	..	7	..	17½
34	8·5	1⅜	..	..	..	17
32	8	..	1⅛	6½	..	16½
30·5	7·5	..	..	..	..	16
28	7	1¼	..	..	12	15½
27	6·7	..	1⅛	6	..	15
25·5	6·3	..	..	..	11½	14½
24·7	6	..	1 7/16	..	..	..
23	5·8	..	..	..	11	14
22	5·5	1⅛	1⅛	5½	..	13½

Steady strain.	Working strain.	Chain.		Rope.	
		Cable.	Rigging.	Wire.	Hawser laid.
In tons.		Diameter of link.		Circumferen inches.	
20	5	..	1 5/16	..	10½
18·5	4·6	..	1¼	5	10
17	4·3	1	1 3/16	..	9½
15·5	3·9	..	1⅛	4½	9
14·5	3·6	..	..	..	..
13	3·3	⅞	1 1/16	..	8½
12	3	..	1	..	8
10·5	2·7	..	15/16	4	7½
9	2·4	¾	⅞	3½	7
8	2·1	11/16	13/16	..	6½
7·5	1·9	..	..	..	..
6·5	1·7	⅝	¾	3	6
5·8	1·4	..	11/16	..	5½
5	1·3	9/16	..	..	..
4·3	1·1 cwt.	..	⅝	2½	5
3·5	18	..	9/16	..	4½
3	15	..	½	2	4
2·7	13·5	..	..	1¾	..
2·4	12	..	7/16	..	3½
1·9	9·5	..	⅜	..	3
1·4	7	..	..	1½	2½
1	5	..	5/16	..	2
·9	4·4	..	..	..	1¾
·7	3·4	..	¼	..	1½
·4	2·1	..	3/16	..	1¼
·35	1·8	..	..	..	1
·25	1·3	..	..	..	¾
·2	1·1	.	..	..	½

NOTE.—A four-stranded rope is about ⅓ weaker than a three-stranded one.

Table showing whether a Vessel gains or loses by keeping away a given number of Points from the True Course, thereby enabling her to economise fuel.

Points from the wind.	RATE PER HOUR.								
0	1	2	3	4	5	6	7	8	9
1	1·02	2·04	3·06	4·08	5·1	6·12	7·14	8·16	9·17
2	1·08	2·16	3·25	4·33	5·41	6·49	7·58	8·66	9·74
3	1·2	2·4	3·61	4·81	6·	7·21	8·42	9·6	10·82
4	1·4	2·83	4·24	5·65	7·07	8·48	9·9	11·3	12·73
5	1·8	3·6	5·4	7·2	9·	10·8	12·6	14·4	16·2
6	2·6	5·2	7·84	10·45	13·06	15·68	18·3	20·9	23·52

The upper line shows the rate per hour steaming head to wind.

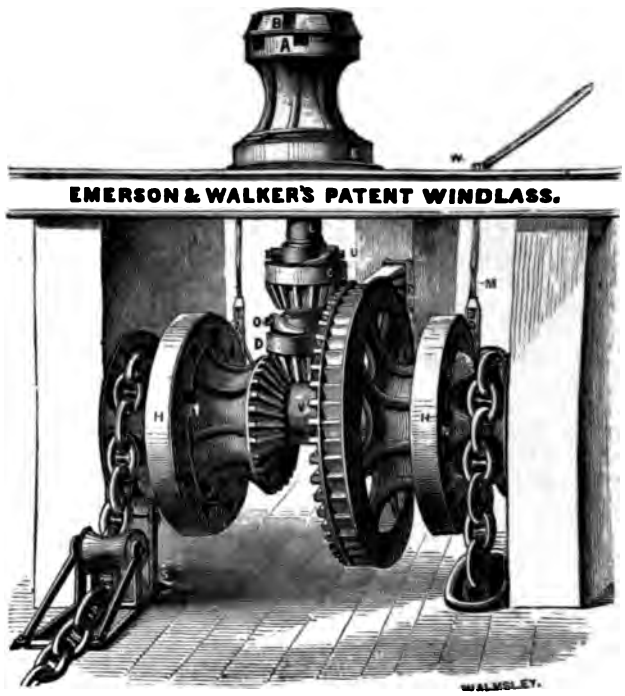
The other lines show the rate a ship must go, if she keeps away, to be in as good a position as she would have been had she held on her course.

EXAMPLE.

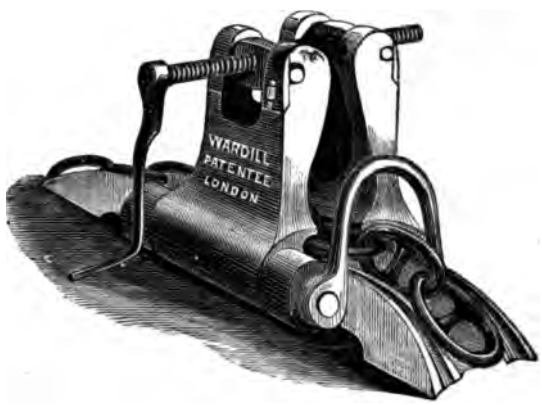
A ship is able to steam 4 knots an hour head to wind; by keeping away 4 points, and setting fore-and-aft sails she makes 6 knots an hour.

The table shows that if she made 5·65 knots, she would be in as good a position as if she remained steering head to wind, therefore if she can steam 6 knots she gains nearly half a knot an hour; but if she can only steam and sail at the rate of 5 knots, she is losing.

If the vessel keeps away 5 points she must steam or sail at the rate of 7·2 knots to be in an equally good position.



EMERSON & WALKER'S PATENT WINDLASS.



DESCRIPTION OF THE WINDLASS.

A is a common capstan, working on the shaft *J* of the windlass, but having no other connexion with it.

B is the windlass capstan head keyed to the shaft *J*. Turn the head round with the sun, and the upper pawls *U* catch into pinion *C*, which acts upon the large wheel on the starboard side of the windlass, and gives the full power. Turn head against the sun, and the lower pawls *O* catch into pinion *D*, which in turn acts upon the smaller wheel on port side of windlass, and gives speed.

The lower end of shaft *J* steps into a cup on the top of centre-piece *V*. To this centre-piece a stay is fixed, which reaches to the pawl bitt when the windlass is in its place. The chain-lifters, when heaving-in the chain, are connected to the body of the windlass by the keys *N N*. When paying-out chain, they are controlled by the friction-bands *H H*.

E is the base of the capstan.

W is the T-piece to which the lever is attached for working break-band, being connected by the rod *M*.

P is the pawl plate, firmly secured to pawl bitt.

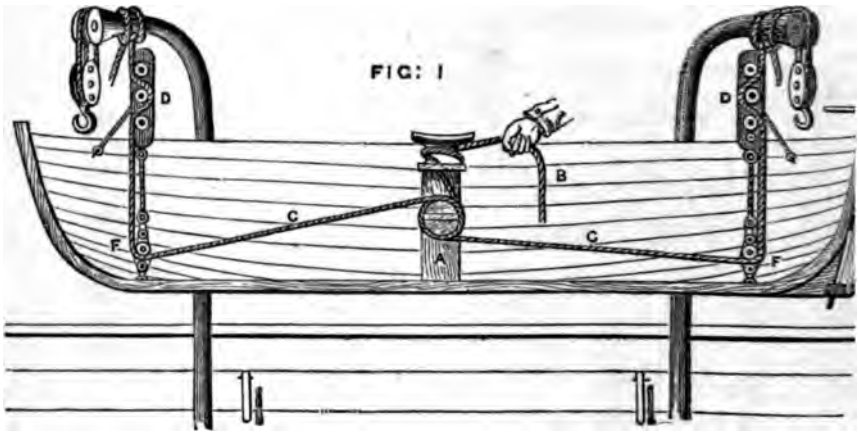
S is a chain guard, which prevents the chain from fouling.

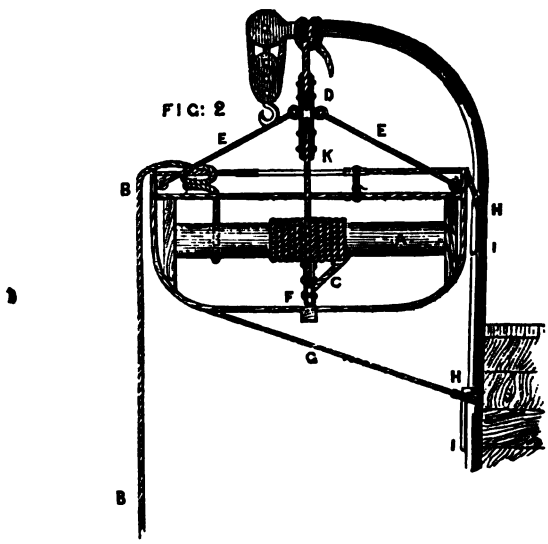
In this figure the chain is shown, on one side, leading aft under a roller, on the other side, directly down into the chain locker.

CLIFFORD'S METHOD OF LOWERING BOATS.

(*For engravings see next page.*)

Fig. 1 shows a side view of a boat, and the gear used for lowering. *A* is a roller which works freely in bearings, at each side of the boat, under one of the seats. *B* is the lowering rope, which is slackened off when lowering. One end is made fast to the roller, and is then wound on it a length equal to the distance the boat will have to descend from the davits to the water. *C C* are two other single ropes or pendants, which are made fast to the davits and pass through the three sheave blocks *D D:* then through the leading blocks *F F;* the ends of each then enter the same hole in the roller, but in opposite directions. By hauling on the lowering *B* the roller is turned round, and the pendants are wound on it a length equal to the distance the boat will have to descend to the water. The blocks *D D* act like a sailor's "turn and a half," in the boat, on each pendant, breaking the strain to the man lowering, and giving him control over the descent of the boat, whatever its weight may be. The nip of the block only exists so long as there is any strain on the pendants passing through it, and ceases on the lowering line being let go when the boat reaches the water. This power of the block to decrease and control the descending weight of the boat whilst the lowering rope is in the hand of the man attending





DESCRIPTION OF THE PLATES.

A Roller on which pendants are wound.
B Lowering line, which is slacked off when lowering.
C Pendants.
D Three sheave block, the *sip* giving controlling power.
E Steadying lines, to prevent the boat from canting.
F Single block on keel, taking the weight of the boat.
G Boat's gripes in two parts.
H Thimbles at each end of gripes, which pass down prongs.
I Prongs down which the thimbles pass as boat is lowered.
K Lanyard for setting up gripes.

to it, and yet allowing all to run free the moment it is let go, is its chief feature, and that which befits it for the purpose to which it is here applied, and for which it was specially designed. The pendants being tapered at the ends, freely overhaul themselves.

Fig. 2 is a cross-view of a boat hanging to the ship's side, lashed and ready for lowering. *E E* are the steadying lines attached to the sides of the boat; the nip in the rope in the block, *D D*, drags the block in a direction contrary to the descent of the boat, tightens the steadying lines, and thus prevents the boat from canting. Consequently the greater the weight of the boat, the greater the security against canting. The gripe *G* is made in two parts, with thimbles at each end, held together by a lanyard. When the boat is hanging on the pendants, the gripes are passed round the boat, and the thimbles *H H* up the prongs *I I*; the lanyard *K* is then hauled taut, and thus the boat is lashed to the ship's side. When the boat is lowered, the thimbles slip down the prongs, and the boat is free.

DIRECTIONS FOR LOWERING.

One of the boat's crew must take charge of the lowering line B, throw the spare line over the boat's side, and then with *one round turn* on the cleat *slacken it off slowly*. The gripes will release themselves by the thimbles passing down the prongs. When the boat reaches the water, let go the rope, the pendants not being fastened will overhaul, and the boat will be perfectly free.

ON THE MANAGEMENT OF OPEN ROWING-BOATS IN A SURF; BEACHING THEM, &c.

The National Life-Boat Institution some time since collected information from 128 different places on the coasts of the United Kingdom regarding the system of management of boats in a surf and broken water, pursued by fishermen and other coast boatmen.

It has appeared to the Committee of the Institution that the information obtained in this manner and in other ways may with advantage be published and circulated, for the guidance of those who may have insufficient experience in the management of boats under such circumstances.

Rules for the management of boats in a surf and broken water, naturally fall under two heads, viz.—1st. Their management when proceeding from the shore to seaward against the direction of the surf. 2d. Their management under the opposite circumstances of running for the shore before a broken sea.

Before stating the course to be pursued under each head, we may remark, that it is an axiom almost universally acknowledged, that there is, as a general rule, *far more danger when running for the shore before a broken sea, than when being propelled against it* on going from the land; the danger consisting in the liability of a boat to broach-to and upset, either by running her bow under water, or by her being thrown on her beam-ends, and overturned broadside on.

RULES OF MANAGEMENT.

I. *In rowing to Seaward.*

As a general rule, *speed must be given to a boat rowing against a heavy surf.* Indeed, under some circumstances, her safety will depend on the utmost possible speed being attained on making a sea. For if the sea be really heavy, and the wind blowing a hard on-shore gale, it can only be by the utmost exertions of the crew that any headway can be made. The great danger then is, that an approaching heavy sea may carry the boat away on its front, and turn it broadside on, or up-end it, either effect being immediately fatal. A boat's only chance in such a case, is to obtain such way as shall enable her to pass, end on, through the crest of the sea, and leave it as soon as possible behind her.

If there be rather a heavy surf, but no wind, or the wind off shore, and opposed to the surf, as is often the case, a boat might be propelled so rapidly through it that her bow would fall more suddenly and heavily after topping the sea than if her way had been checked; and it may therefore only be when the sea is of such magnitude, and the boat of such a character, that there may be chance of the former carrying her back before it, that full speed should be given to her.

It may also happen that, by careful management under such circumstances, a boat may be made to avoid the sea, so that each wave may break ahead of her, which may be the only chance of safety in a small boat; but if the shore be flat, and the broken water extend to a great distance from it, this will often be impossible.

The following general rules for rowing to seaward may therefore be relied on:—

1. If sufficient command can be kept over a boat by the skill of those on board her, avoid or "dodge" the sea if possible, so as *not to meet it at the moment of its breaking or curling over.*

2. Against a head gale and heavy surf, *get all possible speed on a boat on the approach of every sea which cannot be avoided.*

3. If more speed can be given to a boat than is sufficient to prevent her being carried back by a surf, *her way may be checked on its approach*, which will give her an easier passage over it.

II. *On running before a Broken Sea, or Surf, to the Shore.*

The one great danger, when running before a broken sea, is that of *broaching-to.* To that peculiar effect of the sea so frequently destructive of human life, the utmost attention must be directed.

The cause of a boat's broaching-to when running before a broken sea or surf is, that her own motion being in the same direction as that of the sea, whether it be given by the force of oars or sails, or by the force of the sea itself, she opposes no resistance to it, but is carried before it. Thus if a boat be running with her bow to the shore, and her stern to the sea, the first effect of a surf or roller on its overtaking her, is to throw up the stern, and as a consequence to depress the bow;

if she then has sufficient inertia (which will be proportional to weight) to allow the sea to pass her, she will in succession pass through the descending, the horizontal, and the ascending positions, as the crest of the wave passes successively her stern, her midships, and her bow, in the reverse order in which the same positions occur to a boat propelled to seaward against a surf. This may be defined as the safe mode of running before a broken sea.

But if a boat, on being overtaken by a heavy surf, has not sufficient inertia to allow it to pass her, the first of the three positions above enumerated alone occurs—her stern is raised high in the air and the wave carries the boat before it, on its front, or unsafe side, sometimes with frightful velocity, the bow all the time deeply immersed in the hollow of the sea, where the water, being stationary, or comparatively so, offers a resistance, whilst the crest of the sea, having the actual motion which causes it to break, forces onward the stern, or rear end of the boat. A boat will in this position sometimes, aided by careful oar-steerage, run a considerable distance until the wave has broken and expended itself. But it will often happen, that *if the bow be low it will be driven under water*, when the buoyancy being lost forward, whilst the sea presses on the stern, the boat will be thrown (as it is termed) end over end; or if the bow be high, or it be protected, as in some life-boats, by a bow air-chamber, so that it does not become submerged, that the resistance forward acting on one bow will slightly turn the boat's head, and the force of the surf being transferred to the opposite quarter, *she will in a moment be turned round broadside by the sea* and be thrown by it on her beam-ends, or altogether capsized. It is in this manner that most boats are upset in a surf, especially on flat coasts, and in this way many lives are annually lost amongst merchant seamen when attempting to land after being compelled to desert their vessels.

Hence it follows that the management of a boat, when landing through a heavy surf, must as far as possible be assimilated to that when proceeding to seaward against one, at least so far as to stop her progress shoreward at the moment of being overtaken by a heavy sea, and thus enabling it to pass her. There are different ways of effecting this object:—

1st. *By turning the boat's head to the sea before entering the broken water, and then backing in stern foremost, pulling a few strokes ahead to meet each heavy sea and then again backing astern.* If a sea be really heavy and a boat small, this plan will be generally the safest, as a boat can be kept more under command when the full force of the oars can be used against a heavy surf than by backing them only.

2d. If rowing to shore with the stern to seaward, *by backing all the oars on the approach of a heavy sea,* and rowing ahead again as soon as it has passed to the bow of the boat, thus rowing in on the back of the wave; or, as is practised in some life-boats, placing the after-oarsmen with their faces forward, and making them row back at each sea on its approach.

3d. If rowed in bow foremost, by towing astern a pig of ballast or large stone, or a large basket, or a canvas bag termed a "drogue" or

drag, made for the purpose, the object of each being to hold the boat's stern back and prevent her being turned broadside to the sea or broaching-to.

Drogues are in common use by the boatmen on the Norfolk coast; they are conical-shaped bags of about the same form and proportionate length and breadth as a candle extinguisher, about two feet wide at the mouth, and four and a half feet long. They are towed with the mouth foremost by a stout rope, a small line, termed a tripping-line, being fast to the apex or pointed end. When towed with the mouth foremost they fill with water, and offer a considerable resistance, thereby holding back the stern; by letting go the stouter rope and retaining the smaller line, their position is reversed, when they collapse, and can be readily hauled into the boat.

Drogues are chiefly used in sailing-boats, when they both serve to check a boat's way and to keep her end on to the sea. They are, however, a great source of safety in rowing-boats, and many rowing life-boats are now provided with them.

A boat's sail bent to a yard and towed astern loosed, the yard being attached to a line capable of being veered, hauled, or let go, will act in some measure as a drogue, and will tend much to break the force of the sea immediately astern of the boat.

Heavy weights should be kept out of the extreme ends of a boat; but when rowing before a heavy sea the best trim is deepest by the stern, *which prevents the stern being readily beaten off by the sea.*

A boat should be steered by an oar over the stern or on one quarter when running before a sea, as the rudder will then at times be of no use.

The following general rules may therefore be depended on when running before, or attempting to land, through a heavy surf or broken water:—

1. As far as possible avoid each sea by placing the boat where the sea will break ahead of her.

2. If the sea be very heavy, or if the boat be small, and especially if she have a square stern, *bring her bow round to seaward and back her in,* rowing ahead against each heavy surf, sufficiently to allow it to pass the boat.

3. If it be considered safe to proceed to the shore bow foremost, *back the oars against each sea* on its approach, so as to stop the boat's way through the water as far as possible, and if there is a drogue or any other instrument in the boat which may be used as one, tow it astern to aid *in keeping the boat end on to the sea,* which is the chief object in view.

4. Bring the principal weights in the boat towards the end that is to seaward; but not to the extreme end.

5. If a boat worked by both sails and oars be running under sail for the land through a heavy sea, her crew should, under all circumstances, unless the beach be quite steep, *take down her masts and sails* before entering the broken water, and take her to land *under oars alone,* as above described. If she have sails only, her sails should be much reduced, a half-lowered foresail or other small head-sail being sufficient.

III. *Beaching, or Landing through a Surf.*

The running before a surf or broken sea, and the beaching or landing of a boat, are two distinct operations; the management of boats as above recommended has exclusive reference to running before a surf where the shore is so flat that the broken water extends to some distance from the beach. Thus on a very steep beach the first heavy fall of broken water will be on the beach itself, whilst on some very flat shores there will be broken water as far as the eye can reach, sometimes extending to even four or five miles from the land. The outermost line of broken water, on a flat shore, where the waves break in three and four fathoms water, is the heaviest, and therefore the most dangerous, and when it has been passed through in safety, the danger lessens as the water shoals, until on nearing the land its force is spent and its power harmless. As the character of the sea is quite different on steep and flat shores, so is the customary management of boats on landing different in the two situations. On the flat shore, whether a boat be run or backed in, she is kept straight before or end on to the sea until she is fairly aground, when each surf takes her further in as it overtakes her, aided by the crew, who will then generally jump out to lighten her, and drag her in by her sides. As above stated, sail will in this case have been previously taken in if set, and the boat will have been rowed or backed in by oars alone.

On the other hand, on the *steep* beach it is the general practice, in a boat of any size, to sail right on to the beach, and, in the act of landing, whether under oars or sail, to turn the boat's bow half round, towards the direction in which the surf is running, so that she may be thrown on her broadside up the beach, where abundance of help is usually at hand to haul her as quickly as possible out of the reach of the sea. In such situations we believe it is nowhere the practice to back a boat in stern foremost under oars, but to row in under full speed as above described.

IV. *Boarding a Wreck or a Vessel, under Sail or at Anchor, in a Heavy Sea.*

The circumstances under which life-boats or other boats have to board vessels, whether stranded or at anchor, or under weigh, are so various that it would be impossible to draw up any general rule for guidance. Nearly everything must depend on the skill, judgment, and presence of mind of the coxswain or officer in charge of the boat, who will often have those qualities taxed to the utmost, as undoubtedly the operation of boarding a vessel in a heavy sea or surf is frequently one of extreme danger.

It will be scarcely necessary to state that, whenever practicable, a vessel, whether stranded or afloat, should be boarded to leeward, as the principal danger to be guarded against must be the violent collision of the boat against the vessel, or her swamping or upsetting by the rebound of the sea, or by its irregular direction on coming in contact with a solid body; and as the greater violence of the sea on the windward side is

much more likely to cause such accidents, the danger must, of course, also be much greater when the vessel is aground and the sea breaking over her. The chief dangers to be apprehended on boarding a stranded vessel on the lee side, if broadside to the sea, is the falling of the masts; or if they have been previously carried away, the damage or destruction of the boat amongst the floating spars and gear alongside. It may, therefore, under such circumstances, be often necessary to take a wrecked crew into a life-boat from the bow or stern; otherwise a rowing-boat, proceeding from a lee-shore to a wreck, by keeping under the vessel's lee, may use her as a breakwater, and thus go off in comparatively smooth water, or at least shielded from the worst of the sea. This is, accordingly, the usual practice in the rowing life-boats around the United Kingdom. The larger sailing life-boats, chiefly on the Norfolk and Suffolk coasts, which go off to wrecks on outlying shoals, are, however, usually anchored to windward of stranded vessels, and then veered down to 100 or 150 fathoms of cable, until near enough to throw a line on board. The greatest care under these circumstances has, of course, to be taken to prevent actual contact between the boat and the ship; and the crew of the latter have, sometimes, to jump overboard, and to be hauled to the boat by ropes.

In every case of boarding a wreck or a vessel at sea, it is important that the lines by which a boat is made fast to the vessel should be of sufficient length to allow of her rising or falling freely with the sea, and every rope should be kept in hand ready to cut or slip it in a moment, if necessary. On wrecked persons or other passengers being taken into a boat in a sea-way, they should be placed on the thwarts in equal numbers on either side, and be made to sit down, all crowding or rushing headlong into the boat being prevented as far as possible, and the captain of the ship, if a wreck, should be called on to remain on board her to preserve order until every other person should have left the ship.

PRACTICAL HINTS FOR THE CONSIDERATION AND GUIDANCE OF SEAMEN AND OTHERS HAVING CHARGE OR COMMAND OF BOATS.

1. Acquire the habit of sitting down in a boat, and *never stand up* to perform any work which may be done sitting.

2. *Never climb the mast of a boat* even in smooth water, to reeve halliards, or for any other purpose, but unstep and lower the mast in preference. Many boats have been upset, and very many lives lost, from this cause. The smaller a boat the more necessary this and the foregoing precaution.

3. All spare gear, such as masts, sails, oars, &c., which are stowed above the thwarts, should be lashed close to the sides of a boat; and any heavy articles on the boat's floor be secured, as well as possible, amidships, to prevent them all falling to leeward together on a heavy lurch of the sea.

4. On a vessel getting stranded or otherwise disabled in a heavy sea, or on an open coast where there is a high surf on the beach, the crew should remain by their vessel as long as they can safely do so, in preference to taking to their boats. As a general rule, much more risk is incurred in a boat than in a ship, so long as the latter will hold together. Indeed, in a moderate wind on a lee-shore in open situations, and even in a calm, there is frequently more surf than any ordinary ship's boat can with safety attempt, however well managed she may be.

5. After being compelled to desert a ship in an ordinary ship's boat, too great precaution cannot be taken before attempting to land. Viewed from to seaward *a surf has never so formidable an appearance* as when seen from the land; persons in a boat outside the broken water are therefore apt to be deceived by it. They should accordingly, if practicable, proceed along the land outside the surf, until abreast of a coast-guard or life-boat station, or fishing village, whence they might be seen by those on shore, who would then signalize to them where they might safest attempt to land, or warn them to keep off; or who might proceed in a life-boat or fishing-boat to their aid, the generality of coast fishing-boats being far better able to cope with a surf than a ship's boat, and the coast-boatmen being more skilful in managing boats in a surf than the crews of ships. If in the night, double precaution is necessary—and it will in general be much safer to anchor a boat outside the surf until daylight than to attempt to land through it in the dark. For this reason an anchor and cable should always be put into a boat before leaving the ship, and also two or three buckets, in addition to the baler or hand-pump, which should always be kept in her, so that she might be quickly relieved of any water she might ship.

6. *Boats may ride out a heavy gale in the open sea, in safety* if not in comfort, by lashing their spars, oars, &c., together, and riding to leeward of them, secured to them by a span. The raft thus formed will break the sea: it may either be anchored or drifting, according to circumstances.

If the boat has a sail, the yard should be attached to the spars with the sail loosed. It will break much sea ahead. Also a weight suspended to the clue of the sail will impede drift when requisite. In all cases of riding by spars, not less than two oars should be retained in the boat, to be ready for use in case of parting from the spars.

7. Where a surf breaks at only a short distance from the beach, a boat may be veered and backed through it, from another boat anchored outside the surf, when two or more boats are in company; or she may be anchored and veered, or backed in from her own anchor.

8. Ships' boats should, in addition to their oars, masts, and sails, have the following articles kept in them when at sea, or, if not in them, they should be placed in them if possible before deserting a ship at sea:—

A baler or hand-pump, and buckets; the plug, and a spare one, both fastened by lanyards; spare thole-pins and grummets, if rowed in that manner; two or three spare oars; a small hatchet; an anchor and cable; a long small line as a whale-line or deep-sea lead-line, and any

life-buoys or life-belts which are on board. If in the night or at a distance from the land, a lantern and matches, and if available, blue lights or hand-rockets. If beyond sight of land, a compass and telescope, and of course fresh water and provisions. A log-line and sand-glass, a hand-lead and line, small arms and ammunition (with ball-cartridges and small shot). A red flag and a boat-hook for a flag-staff might often be useful to attract attention. A red flannel shirt is a good substitute for a flag.

9. In addition to the above, small empty casks or breakers, tightly bunged and lashed beneath the thwarts, would partially convert any boat into a life-boat, by making it impossible for her to founder; and by leaving less space to be occupied by water if filled by a sea, their use would much expedite the process of pumping or baling out.

10. No ship's boat should either be lowered into or hoisted from the water, without first having a rope from the forepart of the ship made fast to her bows, by which means she will be much steadied, and will be prevented going adrift if the tackles should be prematurely unhooked or carried away. The rudder should be slung, to prevent its being lost if accidentally unshipped.

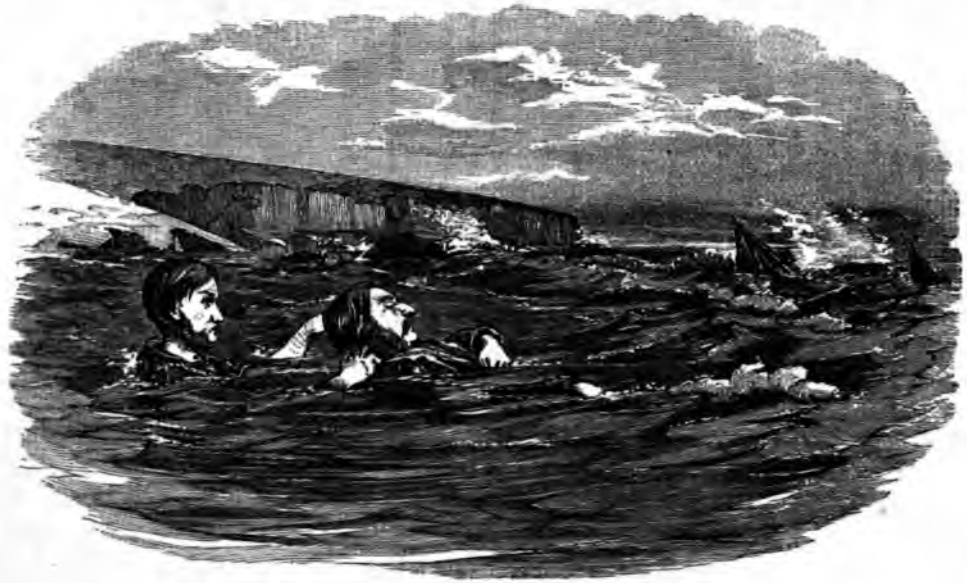
INSTRUCTIONS FOR SAVING DROWNING PERSONS BY SWIMMING TO THEIR RELIEF.

1st. When you approach a person drowning in the water, assure him, with a loud and firm voice, that he is safe.

2d. Before jumping in to save him, divest yourself as far and as quickly as possible of all clothes; tear them off if necessary, but if there is not time, loose, at all events, the foot of your drawers if they are tied, as, if you do not do so, they fill with water and drag you.

3d. On swimming to a person in the sea, if he be struggling, do not seize him then, but keep off for a few seconds till he gets quiet, for it is sheer madness to take hold of a man when he is struggling in the water, and if you do, you run a great risk.

4th. Then get close to him and take fast hold of the hair of his head, turn him as quickly as possible on to his back, give him a sudden pull and this will cause him to float, then throw yourself on your back also, and swim for the shore, both hands having hold of his hair, you on your back and he also on his, and of course his back to your stomach. In this way you will get sooner and safer ashore than by any other means, and you can easily thus swim with two or three persons; the writer has often, as an experiment, done it with four, and gone with them forty or fifty yards in the sea. One great advantage of this method is that it enables you to keep your head up, and also to hold the person's head up you are trying to save. It is of primary importance that you take fast hold of the hair, and throw both the person and yourself on your backs. After many experiments, I find this vastly



preferable to all other methods. You can, in this manner, float nearly as long as you please, or until a boat or other help can be obtained.

5th. I believe there is no such thing as a death-*grasp*, at least it must be unusual, for I have seen many persons drowned, and have never witnessed it. As soon as a drowning man begins to get feeble and to lose his recollection, he gradually slackens his hold until he quits it altogether. No apprehension need, therefore, be felt on that head when attempting to rescue a drowning person.

6th. After a person has sunk to the bottom, if the water be smooth, the exact position where the body lies may be known by the air-bubbles, which will occasionally rise to the surface, allowance being of course made for the motion of the water, if in a tide-way or stream, which will have carried the bubbles out of a perpendicular course in rising to the surface. A body may be often regained from the bottom before too late for recovery, by diving for it in the direction indicated by these bubbles.

7th. On rescuing a person by diving to the bottom, the hair of the head should be seized by one hand only, and the other used in conjunction with the feet in raising yourself and the drowning person to the surface.

8th. If in the sea, it may sometimes be a great error to try to get to land. If there be a strong "outsetting" tide, and you are swimming either by yourself, or having hold of a person who cannot swim, then get on to your back, and float till help comes. Many a man exhausts himself by stemming the billows for the shore on a back-going tide, and sinks in the effort, when, if he had floated, a boat or other aid might have been obtained.

9th. These instructions apply alike to all circumstances, whether the roughest sea or smooth water.

JOSEPH R. HODGSON.

Sunderland, Dec., 1858.

DIRECTIONS FOR RESTORING THE APPARENTLY DROWNED.

SEND immediately for medical assistance, blankets, and dry clothing, but proceed to treat the patient *instantly* on the spot, in the open air, whether on shore or afloat.

The points to be aimed at are, *first* and *immediately*, the RESTORATION of BREATHING and the PREVENTION of any further DIMINUTION of the WARMTH of the BODY; and, *secondly*, after *breathing* is *restored*, the PROMOTION of WARMTH and CIRCULATION.

The efforts to *restore breathing*, and to *prevent* any further *diminution* of the *warmth* of the *body*, must be commenced immediately and energetically, and must be persevered in for several hours, or until a medical man has pronounced that life is extinct. Efforts to promote *warmth* and *circulation* must be deferred until natural breathing has been restored.

To Restore Breathing.

TO CLEAR THE THROAT.

1. Place the patient face downwards, with one of his arms under the forehead, in which position all fluids will escape by the mouth, and the tongue itself will fall forward, leaving the entrance into the windpipe free. Assist this operation by wiping and cleansing the mouth.

2. If there be only slight breathing—or no breathing, or if it fail, then—

TO EXCITE BREATHING—

3. Turn the patient well and instantly on the side, and—

4. Excite the nostrils with snuff, hartshorn, smelling-salts, or the throat with a feather, &c., if they are at hand. Rub the chest and face warm, and dash cold water on it.

5. If there be no success, lose not a moment, but instantly—

TO IMITATE BREATHING—

6. Replace the patient on the face, raising and supporting the chest well on a folded coat or other article of dress.

7. Turn the body very gently on the side and a little beyond, and then briskly on the face, back again; repeating these measures deliberately, efficiently, and perseveringly about fifteen times in the minute, or once every four seconds, occasionally varying the side.

[*By placing the patient on the chest, the weight of the body forces the air out; when turned on the side, this pressure is removed, and air enters the chest.*]

8. On each occasion that the body is replaced on the face, make uniform but efficient pressure with brisk movement, on the back between and below the shoulder-blades or bones on each side, removing the pressure immediately before turning the body on the side.

[*The first measure increases the expiration, the second commences inspiration.*]

*** The result is *respiration* or *natural breathing*;—and, if not too late,—*life*.

CAUTIONS.

1. Be particularly careful to prevent persons crowding round the body.
2. Avoid all rough usage and turning the body on the back.
3. Under no circumstances hold the body up by the feet.

To prevent any Further Diminution of Warmth.

N.B.—These efforts must be made very cautiously, and must not be such as to promote *warmth* and *circulation rapidly*; for if circulation is induced before breathing has been restored, the life of the patient will be endangered. No other effect, therefore, should be sought from them, than the prevention of evaporation and its result, the diminution of the warmth of the body.

1. Expose the face, neck, and chest, except in severe weather (such as heavy rain, frost, or snow).

2. Dry the face, neck, and chest, as soon as possible with handkerchiefs or anything at hand; and then dry the hands and feet.

3. As soon as a blanket or other covering can be obtained, strip the body; but if no covering can be immediately procured, take dry clothing from the bystanders, dry and re-clothe the body, taking care not to interfere with the efforts to restore breathing.

CAUTIONS.

1. Do *not* roll the body on casks.
2. Do *not* rub the body with salt or spirits.
3. Do *not* inject tobacco-smoke or infusion of tobacco.
4. Do *not* place the patient in a warm bath.

N.B.—The directions are printed in parallel columns to avoid confusion, and to ensure that the efforts to obtain both objects shall be carried on at the same time.

TREATMENT AFTER NATURAL BREATHING HAS BEEN RESTORED, TO PROMOTE WARMTH AND CIRCULATION.

1. Commence rubbing the limbs upwards, with firm grasping pressure and energy, using handkerchiefs, flannels, &c. [*by this measure the blood is propelled along the veins towards the heart*].

The friction must be continued under the blanket, or over the dry clothing.

2. Promote the warmth of the body by the application of hot flannels, bottles, or bladders of hot water, heated bricks, &c., to the pit of the stomach, the armpits, between the thighs, and to the soles of the feet.

3. If the patient has been carried to a house after respiration has been restored, be careful to let the air play freely about the room.

4. On the restoration of life, a teaspoonful of warm water should be given; and then, if the power of swallowing has returned, small quantities of wine, warm brandy and water, or coffee, should be administered. The patient should be kept in bed, and a disposition to sleep encouraged.

GENERAL OBSERVATIONS.

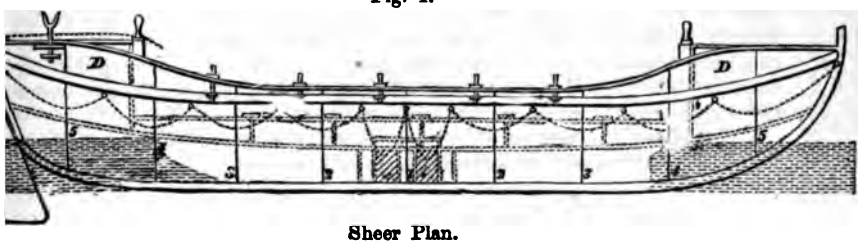
The above treatment should be persevered in for several hours, as it is an erroneous opinion that persons are irrecoverable because life does not soon make its appearance, cases having been successfully treated after persevering for many hours.

APPEARANCES WHICH GENERALLY ACCOMPANY DEATH.

Breathing and the heart's action cease entirely; the eyelids are generally half-closed; the pupils dilated; the jaws clenched; the fingers semi-contracted; the tongue approaches to the under edges of the lips, and these, as well as the nostrils, are covered with a frothy mucus. Coldness and pallor of surface increase.

The leading principles of the above instructions are those of the late Dr. Marshall Hall for the Restoration of the Apparently Dead from Drowning, and are the results of the latest discoveries. The favourable opinion of the principal medical bodies, and of three hundred medical men in this country, as also those of the chief medical bodies on the Continent, have been obtained by the Royal National Life-Boat Institution on the subject.

Fig. 1.



Sheer Plan.

Fig. 2.

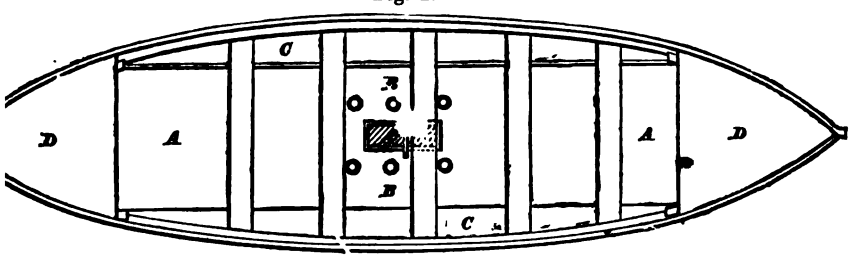
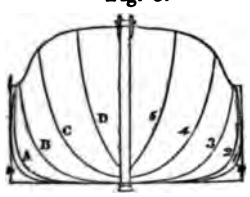
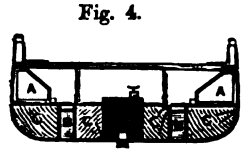


Fig. 3. Deck Plan.



Body Plan.

Fig. 4.



Midship Section.

The accompanying figures show the general form, the nature of the fittings, and air-chambers of one of these boats, 30 feet in length, and 7 feet 6 inches in breadth. In Figs. 1 and 2, the elevation and deck plans, the general exterior form of the boat is shown with the sheer of gunwale, length of keel, and rake or slope of stem and stern-posts. The dotted lines of Fig. 1 show the position and dimensions of the air-chambers within board, and of the relieving-tubes. In Fig. 2, *A* represents the deck, *B* the relieving-tubes (six inches in diameter), *C* the side air-cases, *D* the end air-chambers. In Fig. 3, the exterior form of transverse sections, at different distances from stern to stern, is shown. Fig. 4 represents a midship transverse section, *A* being sections of the side air-cases, *B* the relieving-tubes, bored through solid massive chocks of wood of the same depth as the space between the deck and the boat's floor. *C C* are spaces beneath the deck, filled up, over 6 feet in length, at the midship part of the boat, with solid chocks of light wood, forming a portion of the ballast; *D* is a section of a small draining-tier, having a pump in it, by which any leakage

can be pumped out by one of the crew whilst afloat. The festooned lines in Fig. 2 represent exterior life-lines attached round the entire length of the boat, to which persons in the water may cling till they can be got into the boat; the two central lines are festooned lower than the others, to be used as stirrups, so that a person in the water by stepping on them may climb into the boat.

This life-boat possesses in the highest degree all the qualities which it is desirable that a life-boat should possess:—

1. Great lateral stability.
2. Speed against a heavy sea.
3. Facility for launching and for taking the shore.
4. Immediate self-discharge of any water breaking into her.
5. The important advantage of self-righting if upset.
6. Strength.
7. Stowage-room for a number of passengers.

The following are extracts from the General Rules of Management of the Life-Boat Stations:—

"Each life-boat to have a coxswain superintendent, with a fixed salary of 8*l.* a-year.

"The life-boat to be regularly taken afloat for exercise once every quarter, fully manned and equipped, so that the crew may be familiar with her properties and proper management. On every occasion of exercise the men are paid 5*s.* each in stormy weather, and 3*s.* each in fine weather; and on every occasion of going off to a wreck to save lives, each man of the crew receives 10*s.* by day and 1*l.* by night; but extra or double awards for any special act of gallantry or exertion.

"The crew are provided with life-belts. The coxswain is required to keep a list of all the life-boat stores, which shall be examined once a quarter by the local committee, in order to their being repaired, or replaced, if in the least degree in a doubtful condition.

"The life-boat to be kept, on her carriage, in the boat-house, with all her gear in her ready for use, except articles which require to be secured from damp. Signals are agreed upon for calling the life-boats' crews together; and immediately on intimation of a wreck, or vessel in distress, the coxswain is to muster his crew, launch his boat, and proceed to her assistance.

"The local committee to make quarterly inspection, and report to the Institution as to the behaviour of the boat during exercise, pointing out any defect that may be remedied, and offering any suggestion that may conduce to the efficiency of the service."

By these arrangements the National Life-Boat Institution hopes to have efficient life-boat establishments all round the coasts of the United Kingdom; but to effectually attain the objects of the Institution, it will be manifest that a considerable expense must be incurred, amounting, in fact, from 300*l.* to 400*l.* for the first establishment, and to an average of 30*l.* annually on each life-boat station.

The number of lives saved by the life-boats of the Society, and other means, since its formation, is upwards of 12,200; for which 82 gold medals, 704 silver medals, and 15,250*l.* in cash have been paid in rewards. The Institution has also expended 57,200*l.* on life-boats, life-boat transporting-carriages, and boat-houses.

Without, therefore, the pecuniary assistance, and the hearty general co-operation of the community at large, the objects of the Society cannot be carried out. Its committee of management earnestly appeal to the public to aid them in this necessary and philanthropic undertaking.

LIST OF THE LIFE-BOAT STATIONS OF THE ROYAL NATIONAL LIFE-BOAT INSTITUTION.

ENGLAND.

NORTHUMBERLAND—
1 Berwick-on-Tweed.
Holy Island.
North Sunderland.
Boulmer.
5 Alnmouth.
Hauxley.
Newbiggin.
Blyth, No. 1.
" No. 2.
10 Cullercoats.
Tynemouth, No. 1.
" No. 2.

DURHAM—
Whitburn
Sunderland.
15 Seaton Carew.

YORKSHIRE—
Middlesborough.
Redcar.
Saltburn.
Runswick.
20 Whitby.
Upgang.
Scarborough.
Filey.
Bridlington.
25 Hornsea.
Withernsea.

LINCOLN—
Donna Nook.
Theddlethorpe.
Sutton.
30 Skegness.

NORFOLK—
Hunstanton.
Blakeney.
Sheringham.
Cromer.
35 Mundesley.
Bacton.
Hasborough.
Palling.
Winterton.
40 Caister, No. 1.
" No. 2.
Yarmouth, No. 1.
" No. 2.

SUFFOLK—
Gorlestone.
45 Lowestoft.
Pakefield.
Kessingland.
Southwold, No. 1.
" No. 2.
50 Thorpeness.
Aldborough.

KENT—
Margate.
Kingsgate.
Ramsgate.
55 North Deal.
Walmer.
Kingsdown.
Dover.

SUSSEX—
Dungeness.
60 Rye.
Winchelsea.
Hastings.
Eastbourne.
Newhaven.
65 Brighton.
Shoreham.
Worthing.
Selsey.
West Wittering.

HAMPSHIRE—
70 Hayling Island.
Chapman's Pool.

ISLE OF WIGHT—
Bembridge.
Brighstone Grange.
Brooke.

GUERNSEY—
75 St. Samson's.

DORSET—
Poole.
Lyme Regis.

SOUTH DEVON—
Exmouth.
Teignmouth.
80 Brixham.
Plymouth.

CORNWALL—
Looe.
Fowey.
Falmouth.
85 Cadgwith.
Lizard.
Mullion.
Porthleven.
Penzance.
90 Sennen Cove.
St. Ives.
Hayle.
New Quay.
Padstow.
95 Bude Haven.

NORTH DEVON—
Appledore.
Braunton.
Ilfracombe.

SOMERSET—
Burnham.

WALES.

GLAMORGANSHIRE—
100 Penarth.
Porthcawl.
Swansea.

CARMARTHENSHIRE—
Pembrey and Llanelly.
Carmarthen Bay.

PEMBROKESHIRE—
105 Tenby.
Fishguard.

CARDIGANSHIRE—
Cardigan.
Newquay.
Aberystwith.

MERIONETHSHIRE—
110 Aberdovey.
Barmouth.

CARNARVONSHIRE—
Portmadoc.
Porthdinllaen.

ANGLESEY—
Llanddwyn.
115 Rhoscolyn.
Holyhead.
Cemlyn.
Moelfre.
Penmon.

CARNARVONSHIRE—
120 Orme's Head.

FLINTSHIRE—
Rhyl (Tubular).

CHESHIRE—
New Brighton (No. 1).
Do (Tubular) (No. 2).

LANCASHIRE—
Southport.
125 Lytham.
Blackpool.
Fleetwood.
Piel.

ISLE OF MAN—
Castletown.

CUMBERLAND—
130 Whitehaven.
Maryport.
Silloth.

SCOTLAND.

KIRKCUDBRIGHT—
Kirkcudbright.

WIGTON—
Port Logan.

AYRSHIRE—
135 Girvan.
Ayr.
Irvine.

ARGYLESHIRE—
Campbeltown.

CAITHNESS-SHIRE—
Thurso.

ORKNEY ISLANDS—
140 Stromness.

ELGINSHIRE—
Lossiemouth.

BANFFSHIRE—
Buckie.
Banff

ABERDEENSHIRE—
Fraserburgh.
145 Peterhead.
Stonehaven.

FORFAR—
Arbroath.
Buddon Ness } Dundee.
Broughty Ferry }

FIFESHIRE—
150 St. Andrew's.
Anstruther.

HADDINGTONSHIRE—
North Berwick.
Dunbar.

IRELAND.

Co. LONDONDERRY—
Greencastle.

ANTRIM—
155 Portrush.

DOWN—
Groomsport.
Ballywalter.
Tyrella, Dundrum.
Newcastle, do.

LOUTH—
160 Dundalk.
Drogheda.

DUBLIN—
Balbriggan.
Skerries.
Howth.
165 Poolbeg.
Kingstown.

WICKLOW—
Wicklow.
Arklow.

WEXFORD—
Courtown.
170 Cahore.
Wexford.
Rosslare Fort.
Carnsore.

WATERFORD—
Tramore.
175 Dungarvan.
Ardmore.

CORK—
Youghal.
Ballycotton.
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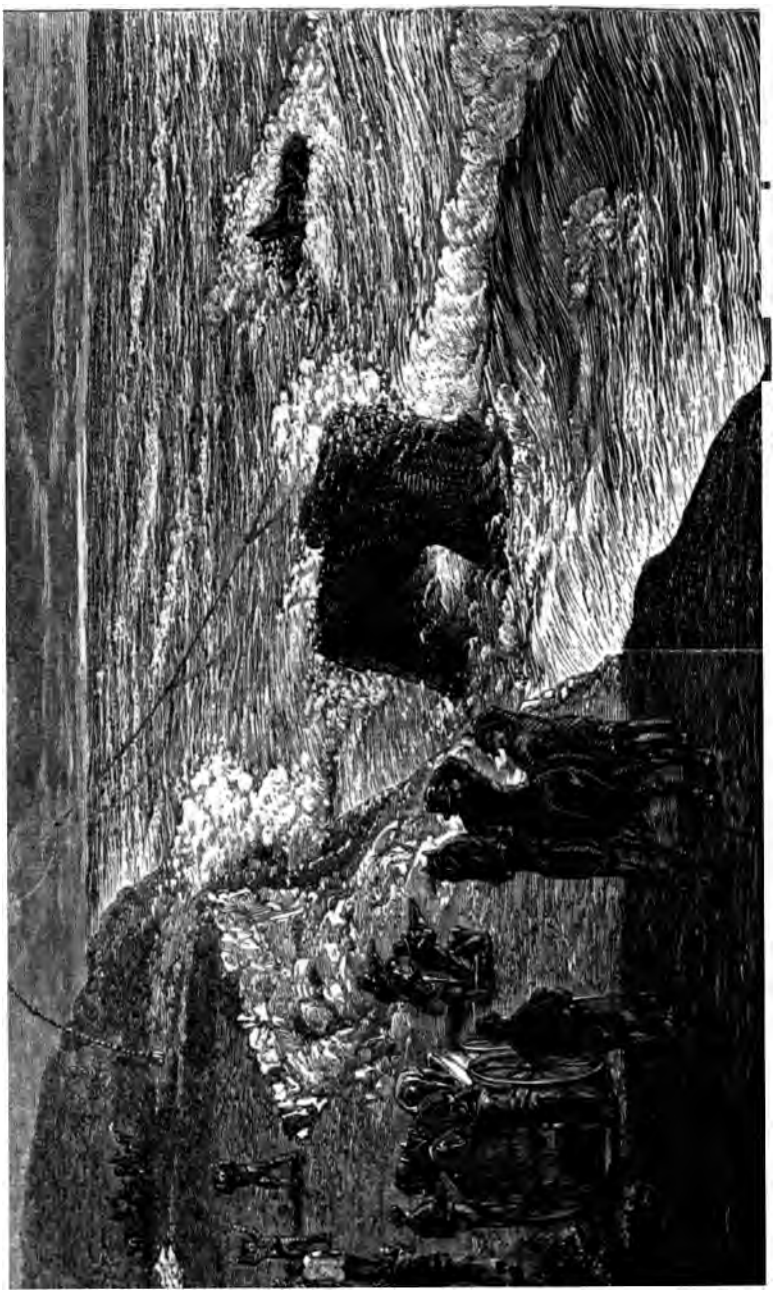
Courtmacsherry.

KERRY—
181 Valentia

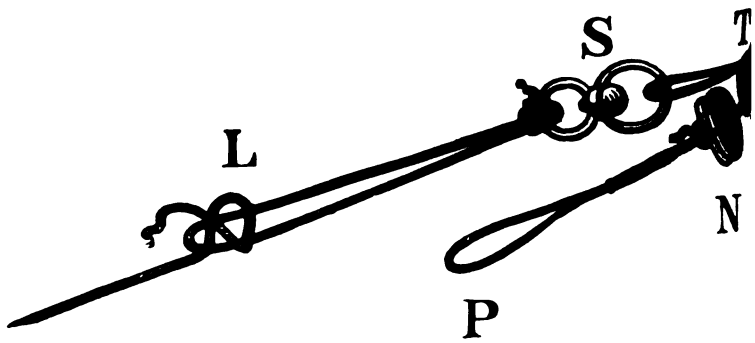
(*See following pages.*)



COMMANDER NARES' LIFE KITE.

Approved by the "*Shipwrecked Fishermen and Mariners' Royal Benevolent Society*," as the best, simplest, and least expensive mode of communicating between a wreck and a lee shore. When the wreck is on a low beach, the Kite may be used, without assistance from the shore, to drag each man to the beach, with or without the help of a life buoy. When opposite to a cliff, the Kite may be used to drag a line on shore, by means of which a hawser may be hauled to the top of the cliff.

The Kite should be flown from the rigging, immediately the vessel commences to drift. The Kite is fitted in the usual manner, with two lines secured to the midship upright cane, one close to the top *B*, and the other close to the bottom *W*. They are connected together, the lower one being rove through a thimble *T*, at the end of the upper one, and knotted to prevent its unreaving again. The upper line has also a swivel *S*, at the end, to keep the turns out of the line used to fly the Kite with. If the Kite is flown with one line, make it fast to the



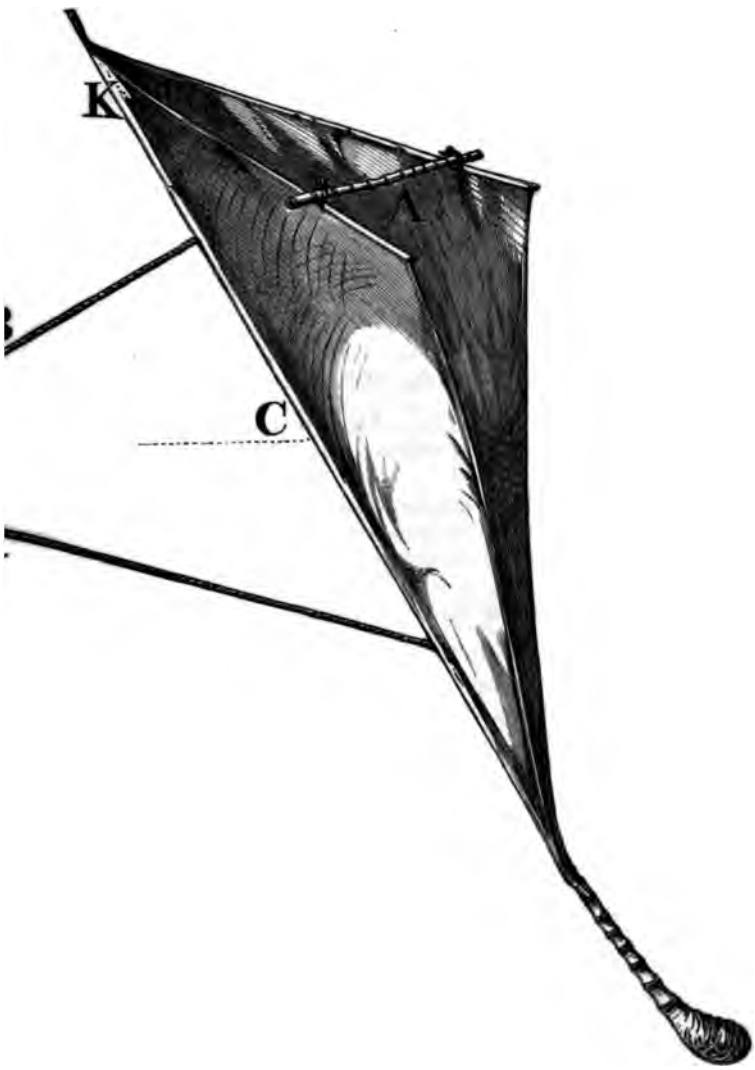
swivel *S*. If flown with two lines, make fast the second to the lower line, *W N P*. The lower line renders through the thimble, *T*, on the upper one, and therefore allows the Kite to be flown at any height, and if necessary to be brought to the ground. The sides of the Kite are fitted to bend back, so that it may be made to hold less wind as the gale increases. In constructing the tail, length is required more than weight.

TO FLY THE KITE.

Bend the line to the swivel on the Kite, *S*, and take a turn with it round a cleat, ready to veer away. See the tail clear, and bent to the bottom of the upright cane. Open and spread the Kite by crossing the stick at the back, *A*.

DO NOT SPREAD THE KITE OUT TOO TIGHT, PARTICULARLY IN WET WEATHER.

If the Kite is unsteady, add a longer tail. *If the Kite pulls too hard*,



do not stretch the sides on so tight. *If not blowing hard*, lighten the tail, *but do not shorten it.*

TO COMMUNICATE WITH THE SHORE.

IF THE WRECK IS ON A BEACH.

After the Kite is steady in the air with about 100 yards of the line out, make fast one end of 20 yards of line to a Kisbie or other life buoy, and the other to the bight of the Kite line. Let a man get into the life buoy. Veer away the line until the man reaches the shore. When he is landed, haul back the Kite and life buoy. The last man will have to cut the line between the buoy and the ship. The first man may carry an extra line with him to be used in the event of accident.

If there is no life buoy on board.—Make fast the Kite line tight round the man under the armpits, with a hitch on the bight, that he may quickly disengage himself. Let him hold on to the line with his hands, the Kite will drag him to the shore.

TO CARRY A HAWSER TO THE CLIFFS.

If a coir hawser.—Bend on a piece of lead line to the Kite line. To this bend the coir hawser. Veer away. The lead line is used to drag the end of the hawser up the cliff.

If a common hawser.—Bend a long lead line to the Kite line. Veer it to the shore. The lead line is then used to haul a larger line to the shore, by which a hawser may be dragged to the top of the cliff.

IF ROCKS INTERVENE,

The Kite may be lowered to the ground by using two lines.

Before flying—Make fast the second line to the loop on the lower of the two Kite lines, *P*. In flying the Kite, keep the second line slack. Festoon it up to the flying line in order to keep it out of the water. Veer away until the Kite is over the cliffs.

TO DROP THE KITE,

Tauten in the second or lower line, *P*, *gradually*. If the Kite is falling short of the cliff, slacken the second line, and the Kite will instantly rise. When the Kite is down, the lines are used to haul larger lines to the shore, by which a hawser may be dragged to the top of the cliff.

The Kite may also be used to take a lead line to a boat to leeward, unable to fetch the ship; to communicate between vessels at sea, in all cases when a boat cannot be used, and to carry a line across a river. Apply to Lapthorn and Sons, Sailmakers, Gosport, Hants; or through the Shipwrecked Mariners' Society, Hibernia Chambers, London Bridge, S.E.

THE CUNNINGHAM SYSTEM FOR REEFING AND UNREEFING TOPSAILS, TOP-GALLANT SAILS, &c., FROM THE DECK.*

This mode of reefing topsails, &c., is now in extensive use in the mercantile marine of this and other countries, and is also on board some of Her Majesty's ships.

The principles of the plan are that the sail is reefed by being rolled up on the yard, which is fitted to revolve for that purpose, and which is caused to rotate by its own weight acting upon an endless chain, in the bight of which the yard is slung, and which forms the topsail tye. One end of the chain is kept fast aloft, whilst the other is hauled or lowered upon, thus parbuckling the yard either way.

The aperture required in the middle of the sail, to enable to roll it up clear of the centre fittings on the yard, is closed up by a cloth attached to travellers, which slide up and down a raised edging on the sides of the aperture; this cloth is called the bonnet, and is self-acting. To prevent the rolled-up sail from chafing against the lee rigging when the yard is braced up, spars, called chafing spars, extend abaft the yard from the centre to the lifts; these spars also carry the studding-sail booms.

It may be remarked that the operation of reefing topsails in the ordinary way is one, under certain circumstances, attended with extreme danger to the men on the yard, and many valuable lives are frequently lost through it. An invention, therefore, which affords the means of this duty being accomplished from the deck without any one going aloft, must be viewed as of the utmost importance to navigation.

To reef the topsail.—Lower away on the after-haulyards, and pull on the foremost or reefing ones, or upon both haulyards *together*, until the sail is set taut.

The down-haul is provided to assist the yard down should it require it.

To shake out reefs—Hoist on the after haul-yards, slack the foremost or reefing ones; *but not too much.*

If the foremost or reefing haulyards are merely steadied in the hand during hoisting, they will slack themselves as much as is required.†

* Invented by Henry W. P. Cunningham, Esq., R.N., F.R.G.S.

† The *foremost*, or reefing haulyards are those which come up *before* the yard.—The *after* haulyards are those which come up *abaft* the yard.

EXPLANATION OF THE FIGURES.

SHOWING THE FITTINGS OF THE TOPSAIL YARDS AND TOPMASTS OF H.M.S. "MEGÆRA" WITH MR. CUNNINGHAM'S REEFING GEAR.

Fig. 1

Represents a topsail yard fitted and rigged complete, the view is looking downwards on the yard.

N N are the lift or yard-arm hoops within which the yard turns round, the two eye bolts appearing at the letters are for the lifts to hook or shackle to.

I I are the top-gallant sheet blocks.

H H are the brace blocks; these are now fitted with clasp hooks.

P P are the top-gallant studding-sail boom irons.

P' P' Quarter irons on the chafing spars for top-gallant studding-sail booms.

D D are the quarter blocks.

b b Inner connecting bolts of chafing spars.

c c Bolts connecting yard to parrel.

a a Stud bolts for inner earings.

M M Jewel blocks fitted for yard to revolve within the thimble, a clasp hooks securing them to bolt.

The sail is bent to a wooden jackstay. The arrangement of the foot-ropes will be easily understood by figure.

Fig. 2

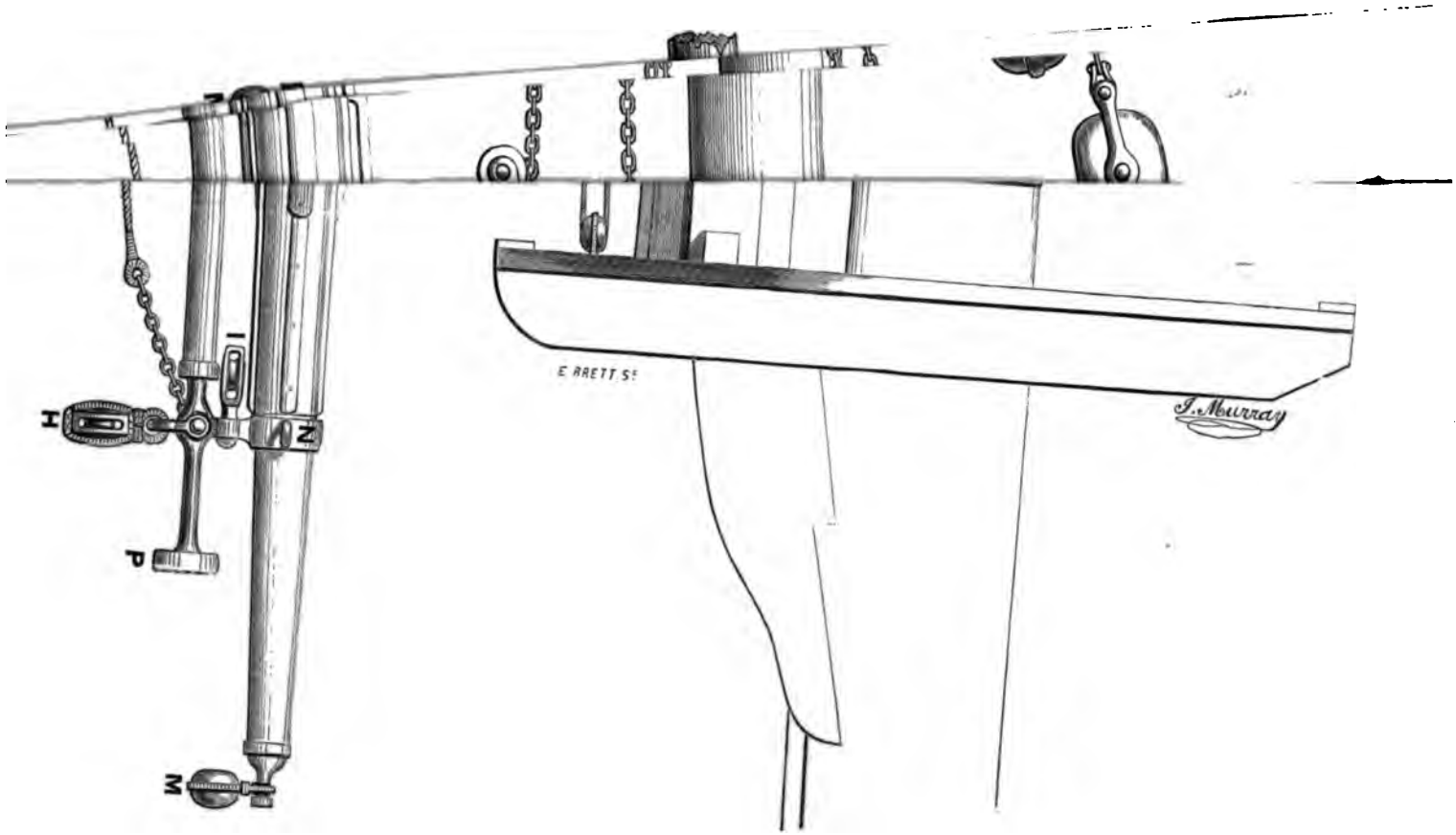
Represents a side view of topmast with lead of topsail tye chains. *A* is the down-haul tackle.

Fig. 3

Is a view on the fore side of the topmast representing the lead of the topsail tye chains, and the mode of keeping the hanging blocks well forward by means of a chain span.

Fig. 4

Represents a proposed arrangement of sheave holes in topmasts instead of hanging blocks. Fish plates are applied on each side to carry the pins and strengthen the topmasts. H.M.S. *Defence* and *Resistance* are fitted in this way.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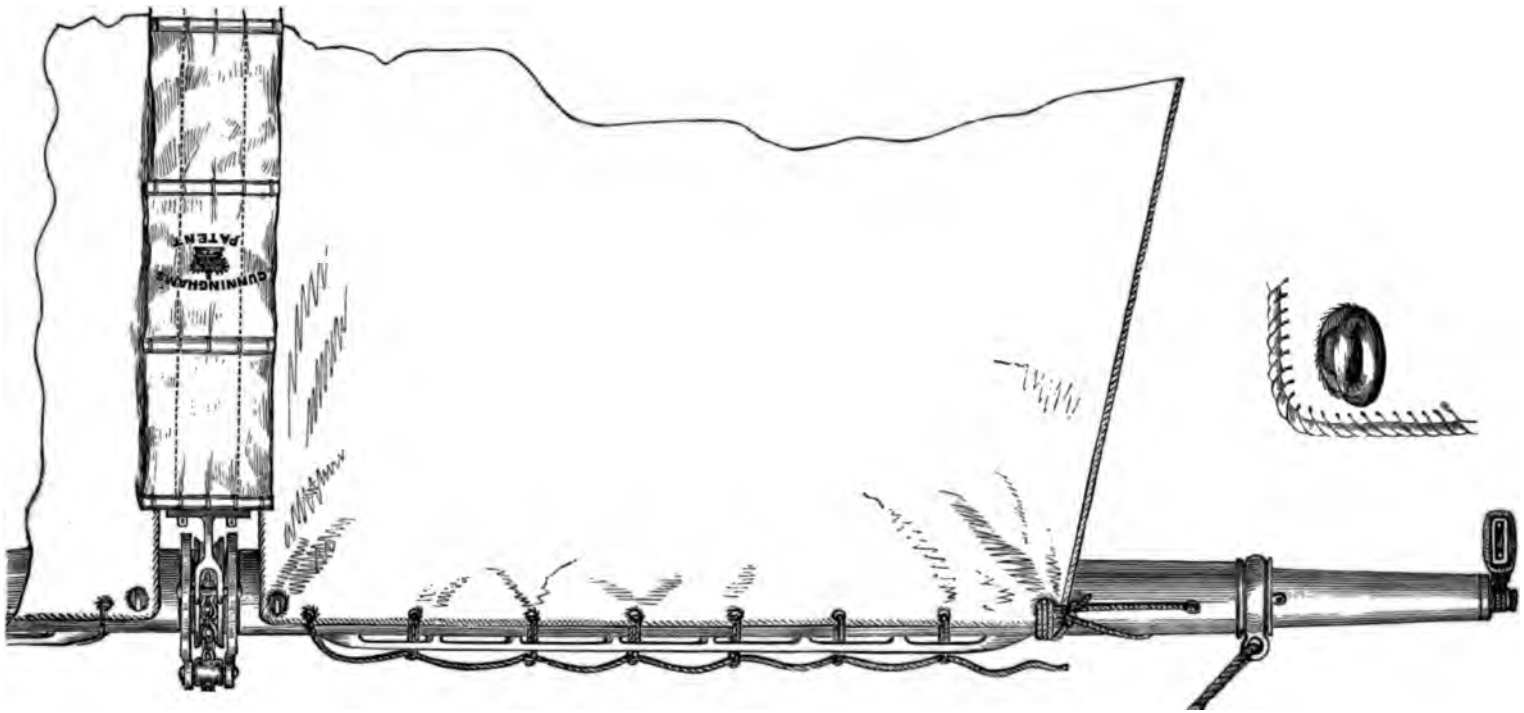
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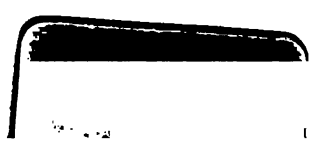
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